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TECHNICAL PUBLICATION NO. 14
OF
The New York State College of Forestry
AT
SYRACUSE UNIVERSITY
FRANKLIN MOON, Dean

IN COOPERATION WITH THE
FOREST SERVICE
U. S. Department of Agriculture
W. B. GREELEY, Forester

WOOD-USING INDUSTRIES OF NEW YORK

BY
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BUREAU OF MYCOLOGY
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HOW TO FIND A MARKET FOR FOREST PRODUCTS

The information assembled in this bulletin can be put to practical use by those who have forest products for sale and desire to find an advantageous market.

Let us suppose, for instance, that you have a quantity of ash for sale and desire to correspond with manufacturers who use ash and are likely to pay good prices. First, turn to the list in the back of the bulletin, entitled "Kinds of Wood Used by the Industries," in which, under the heading "Ash," a large number of articles made from ash are listed. You note that ash is used largely for motor vehicles, handles, vehicle parts, and toys.

Consulting the index you note that the tables numbered 13, 18, 23 and 26 deal with the manufacture of these article and show that the average prices paid for material were $140.77, $49.67, $114.48 and $51 respectively. The makers of motor vehicles and vehicle parts paid more for the high grade of ash consumed than makers of handles and toys, whose uses are much less exacting, and who can utilize smaller dimensions. If the stock is strictly high grade, you may then determine to address the manufacturers of motor vehicles. Accordingly, you turn to the "Directory of Manufacturers," which is the last section in the volume, and find under the heading "Motor Vehicles" the various manufacturers listed alphabetically by towns and counties. If correspondence with those who are in the vicinity does not find a market for the ash, other firms farther away may be addressed or the wood offered to other industries.

If, for any reason, an owner of forest products is unsuccessful in finding a market with the help of this directory, he is invited to correspond with the New York State College of Forestry at Syracuse. The College maintains an exchange between producers and consumers and will gladly try to assist in finding a market for forest products.

Producers should recollect that the prices in this bulletin are for 1919, and while they are of some help for making comparisons in that year, the present prices are much less. It should also be recollected that high prices are only obtained for well manufactured and properly graded stock. Usually, also, purchasers prefer to buy larger rather than smaller lots of stock, other things being equal.

Wood-using plants which have large amounts of waste may find a profitable market for this material in factories which use small pieces for toys, small handles, backs of brushes and mirrors, novelties, furniture parts, souvenirs, small box material, chair stock, and vehicle parts. Conversely, plants which can use small-sized stock may be able to make advantageous purchases of waste from plants which work upon larger stock of the same kinds of wood.

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CONTENTS

PAGE

How to Find a Market for Forest Products ..... Inside Cover
Contents 3
List of Illustrations 5
Explanation and Acknowledgment 7

PART I

Conditions Affecting Lumber Supply of New York 9
Abnormal Business Conditions in 1919 9
The Depleted Forest Wealth of New York 12
Possibilities for Closer Utilization 13
Forest Management Required 16
Possibilities of Farm Woodlots 23
The Need for Action 26

PART II

Discussion of Secondary Wood-Using Industries 30
Summary of Woods Used in New York by Kinds (Table 1) 30
Comparative Statement of Woods Used by Species (Table 1A) 38
Summary of Woods Used in New York by Industries (Table 2) 39
Comparative Statement by Industries (Table 2A) 44
Boxes and Crates, Packing (Table 3) 46
Planing Mill Products (Table 4) 50
Sash, Doors, Blinds, and General Millwork (Table 5) 55
Furniture (Table 6) 59
Ship and Boat Building (Table 7) 63
Musical Instruments (Table 8) 65
Car Construction (Table 9) 70
Shade and Map Rollers (Table 10) 74
Caskets and Coffins (Table 11) 75
Chairs (Table 12) 78
Motor Vehicles (Table 13) 80
Agricultural Implements (Table 14) 83
Boot and Shoe Findings (Table 15) 85
Matches (Table 16) 89
Woodenware and Novelties (Table 17) 90
Handles (Table 18) 92
Refrigerators and Kitchen Cabinets (Table 19) 95
Fixtures (Table 20) 97
Professional and Scientific Instruments (Table 21) 100

Discussion of Secondary Wood-Using Industries — *Concluded* PAGE
Baskets and Fruit Packages (Table 22) ... 102
Vehicles and Vehicle Parts (Table 23) ... 104
Dairymen's, Poulterers', and Apiarists' Supplies (Table 24) ... 108
Tanks and Silos (Table 25) ... 109
Toys (Table 26) ... 112
Picture Frames and Moldings (Table 27) ... 115
Plumbers' Woodwork (Table 28) ... 116
Pumps and Piping (Table 29) ... 118
Laundry Appliances (Table 30) ... 119
Trunks and Suitcases (Table 31) ... 120
Cigar Boxes (Table 32) ... 121
Patterns and Flasks (Table 33) ... 123
Brushes and Brooms (Table 34) ... 125
Shuttles, Spools, and Bobbins (Table 35) ... 127
Electrical Machinery and Apparatus (Table 36) ... 128
Machine Construction (Table 37) ... 129
Pulleys and Conveyors (Table 38) ... 131
Airplanes (Table 39) ... 133
Elevators (Table 40) ... 138
Clocks (Table 41) ... 139
Sporting and Athletic Goods (Table 42) ... 141
Dowels and Skewers (Table 43) ... 142
Firearms (Table 44) ... 144
Whips and Umbrella Sticks (Table 45) ... 145
Printing Material (Table 46) ... 146
Miscellaneous (Table 47) ... 147

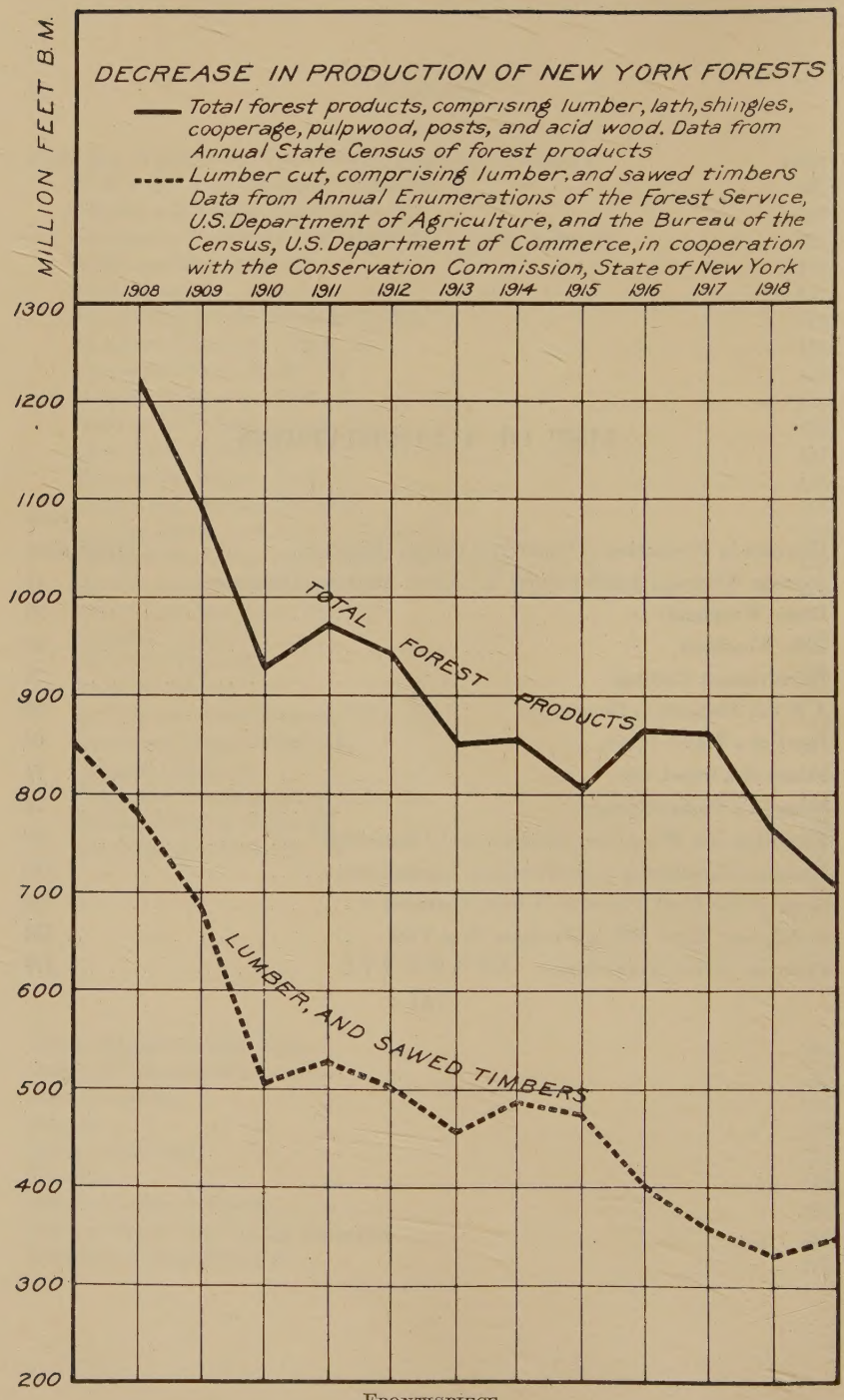
APPENDIX

Forest Products of New York ... 150
Pulpwood Consumption ... 152
Slack Cooperage ... 155
Veneers ... 156
Wood Distillation ... 158
Excelsior ... 159
Relative Utility of Species ... 161
Kinds of Wood Used by the Industries ... 163
Directory of Manufacturers ... 179

LIST OF ILLUSTRATIONS

PAGE

Decrease in Production of New York Forests (Diagram) ..... Frontispiece
Average Wholesale Lumber Prices in Eastern Markets (Diagram) 11
Dense Woodland 20
Thin Woodland 22
Improvement Cuttings 24
A Room Finished in Douglas Fir 52
Parts of a Player Piano 66
Frame of a Street Car 71
Scene in a Casket Factory 76
Evolution of a Wood Heel (Diagram and Illustration) 86
Results of Lumbering in the Northern Appalachians 110
Scene in the Black Forest of Western Germany 136
A Pulp and Paper Mill in Northern New York 154
Counties of New York State 178



FRONTISPIECE

The ominously steep downward slant of these curves threatens New York with the loss of her commanding position in the secondary wood-using industries. Only vigorous and prompt action can provide the billion odd feet of lumber per year which the industries need and which the State is capable of producing. See page 26.

EXPLANATION AND ACKNOWLEDGMENT

The study upon which this report is based was undertaken by The New York State College of Forestry at Syracuse University in cooperation with the Forest Service, U. S. Department of Agriculture. It covers the period of one year ending December 31, 1919, and is in part a revision of the bulletin bearing the same title, published in 1913, covering the calendar year 1912.

As a preliminary step it was necessary to secure the names and addresses of all wood-using operators in the State. The firms listed in the report for 1912 contained the bulk of these addresses. Field agents visited the larger cities in the effort to locate firms established subsequently to the report of 1912, and eliminate those which had gone out of business. In a large number of cities and villages the postmasters corrected the mailing lists. To these wood-using manufacturers a questionnaire was sent asking the information necessary for the purpose of the report. Firms which did not reply were addressed a second time, and after a suitable interval field agents visited these industries which had made no report of their operations. Although a great deal of effort was directed to the preparation of a list which would include all woodworkers, it is known that there are some firms which are not upon the lists, either because of their period of existence, failure to cooperate, changes of name or address, removals, sales, or other reasons which could not be overcome within the time available.

The work was done under the superintendence of Edward F. McCarthy, New York State College of Forestry, and Harold S. Betts, of the Forest Service. Professor McCarthy, as a collaborator, carried the work to a point where all the data had been collected; he also assisted personally on the field work. John T. Harris, of the Forest Service, and Professor Alfred Akerman, of the College of Forestry, also took part in the preliminary planning and correction of the mailing lists.

Information on forest conditions, lumbering, manufacturing, and utilization was secured in all parts of the State by Raymond J. Hoyle, of the New York State College of Forestry, and R. V. Reynolds, of the Forest Service, and these men jointly prepared the text. Credit is due to Albert H. Pierson and Wilbur Mattoon of the Forest Service, who contributed assistance respectively in the completion of the tabulations and the discussion of farm woodlands.

In view of the fact that this is a revision and not a new project, the text of the previous edition has been adopted liberally, wherever it was found applicable.

Similar reports were at one time prepared for all of the important lumber-consuming States, in cooperation with the Forest Service. New York is, however, the first cooperating State to revise her report of the wood-using industries.

PART I

CONDITIONS AFFECTING LUMBER SUPPLY OF NEW YORK

Abnormal Business Conditions in 1919

This revision was undertaken during the latter part of 1919, at a time when business in general was endeavoring to adjust itself to changed conditions following the world war. The absence of four million men in the army caused a serious disruption of their connection with the industries. The transfer of countless others to war industries further disturbed the balance of the economic machinery of the country. Once broken loose from quiet pursuits the roving habit began. Large numbers of workmen, after discharge from military service, never returned permanently to the country districts and villages where they were enlisted, and others drifted to the cities. Labor troubles were acute and strikes were of frequent occurrence, sometimes accompanied by violence, sabotage, and other forms of direct action. The shortage of labor affected not only the wood-working factories but also the sawmills, the logging camps, and the railway systems. Embargoes intended to regulate the transportation of commodities became increasingly frequent and throttled the normal transmission between the mills and the lumber yards. At the same time wages in all branches of labor had been approximately doubled to meet the increasing cost of the necessities of life. Behind and beneath these surface disturbances lay the fact, often flouted but inexorable, that the depletion of the timber supply in the United States has arrived at the acute stage.

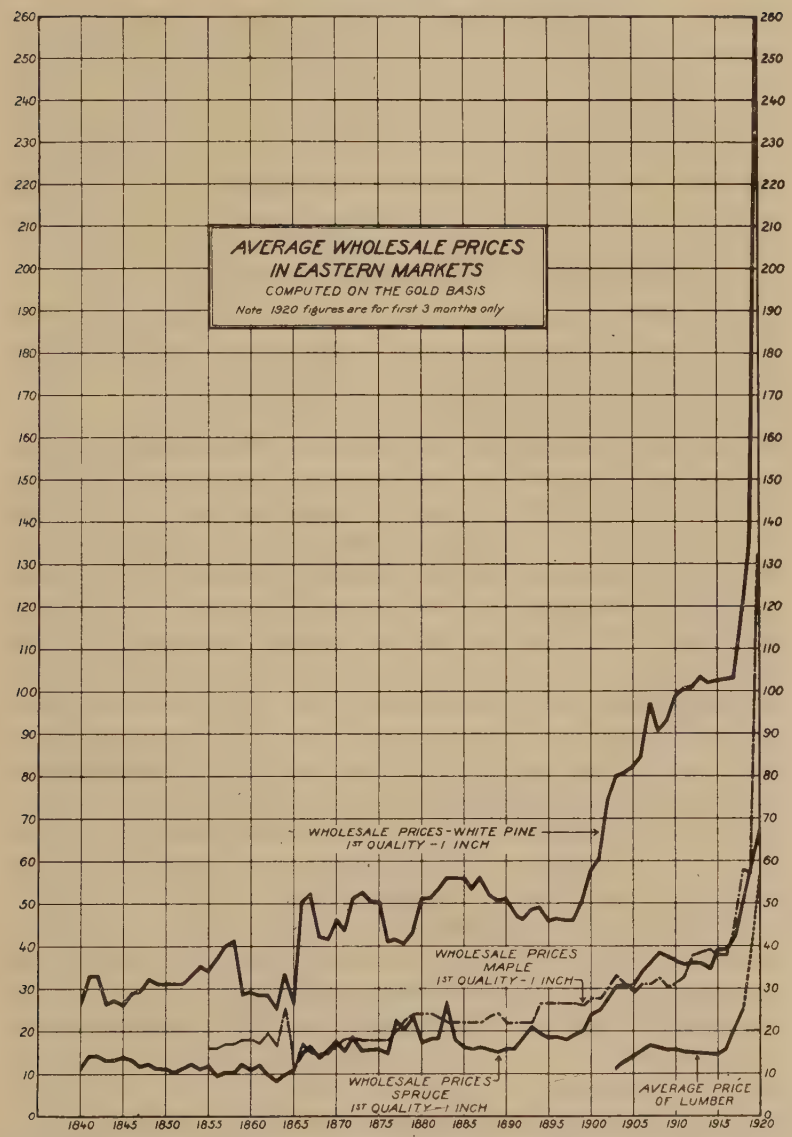
The result of these conditions was an unprecedented rise in the cost of lumber of all kinds, which became notable during the summer of 1919, and continued steadily until it reached its

peak in March, 1920. This rise was so pronounced that the average mill price of lumber was tripled within nine months. The cost of building material became prohibitive and this, in conjunction with the advancing rates demanded for loans and the labor and transportation difficulties, practically resulted in the shutting down of the building trades in the face of a demand for housing facilities for approximately four million people. This abnormal demand was attributed in part to the drift of workers from the country to the cities, attracted by high wages and a generally higher standard of living. As a matter of fact the country regions were also experiencing a lack of houses. The suspension of building had resulted in a general shortage of homes for the normally increasing population. Rents of both homes and factory space were exceedingly high.

The cities thus contained not only the surplus laborers and craftsmen, but also the larger lumber markets which had the best chances of obtaining supplies of material from the mills. Also there were better facilities within the cities to obtain power derived either from hydroelectric sources or the use of coal as fuel, while remote country towns were less favored, owing to the partial failure of railroad transportation.

As might be expected under these conditions the returns resulting from this study show the total number of firms engaged in the wood-using industries of New York decreased by 35 per cent, the number of firms in the cities of the first class decreased 25 per cent, while those in the small towns and villages decreased 40 per cent. Although there are only a few cases actually noted in which country firms actually moved to the city, yet it appears that the city firms had a stronger business foothold against adverse conditions. The reduction of the number of firms was no doubt caused in part by the tendency noted for many years toward the consolidation of business in fewer hands with larger capitalization.

During the depression in the year following the war many firms suspended operation, although rather less than the normal number went into bankruptcy.



The rocketing price of white pine and other essential woods in 1920 is a landmark in the forest economics of America. On account of the shortage of houses it resulted in misery for millions of Americans. An ample and well distributed supply of lumber was needed as never before. Should we restore the forests or idly await another catastrophe?

In the consideration of the reports, and in the conclusions drawn from them, it has been the endeavor of the authors to give due weight to these abnormal conditions.

The rapidly advancing depletion of the forests of New York is obvious in most of the industries. A serious situation is in view even after making allowances for the abnormal conditions in the business world.

The Depleted Forest Wealth of New York

For variety of valuable tree species and the quality of its forest products, combined with long-sustained yield in large quantities, few other States have rivaled New York. Eighty years ago New York led all States in the production of lumber, and the supply was then supposed to be inexhaustible. In 1850, New York ranked first in lumber cut and furnished 20 per cent of the national supply. Today New York has dropped to the twenty-fifth place among the lumber-producing States, and the annual cut is only one per cent of the entire production in the United States. The remaining stand is estimated roughly at 26 billion board feet, of a quality decidedly inferior to that of earlier days.

The State Forester reports that in 1908 the total forest products of the State were 1,226,754,000 feet B. M. In 1918 this yield had shrunk to 762,290,000 feet B. M., a reduction of 37 per cent. Between 1907 and 1919 the lumber cut decreased from 848,894,000 feet to 363,000,000 feet. Thus, in 12 years, the New York lumber cut decreased by 59 per cent of its former volume. (See Frontispiece.)

Comparing the figures resulting from this study with those obtained from the same project in 1912, it is noted that in the short space of seven years the amount of lumber supplied by the State to its wood-working industries has diminished from 548,000,000 feet to 189,000,000 feet, a reduction of 65 per cent.

The fact that in 1919 the amount of lumber imported from other States and foreign countries was 115 million feet less than in 1912 is, in part at least, evidence of the increasing

difficulty of obtaining supplies in times of stress from sources over which New York has no control. It is one phase of the threatening conditions which confront the wood-working industries. The fact that a State, once foremost in timber production, should be brought to such a plight, at a time when public desire for the products was never more urgent, reveals the extent to which the depletion of important native species, such as white pine and oak, has proceeded. It is in times of stress that fundamental weaknesses become evident, and the weakest spot in the organism is the one which will probably show the most acute symptoms of distress.

Possibilities for Closer Utilization

In the period of ample wood supply the chief aim of the superintendent of a wood-working plant was to increase his production, without much calculation of the percentage of waste involved. Where not lavishly wasteful his methods may properly be termed economical, for the overhead, the additional attention, and the labor involved in preventing wastage would often have cost more than the material. Shop customs have a tendency to become habits, passed on from one generation of workers to another, and the American shop worker has not always adjusted his methods to the rising cost of material. The frontiersmen who built bonfires of black walnut, oak, and cherry logs were acclaimed as homebuilders at one period in our history, but at this date such destruction of valuable material would be unthinkable.

For ten or fifteen years the doctrine of waste utilization has been given increasingly careful scrutiny in most shops. Yet the present proportion of waste lumber is ordinarily reported as 10 per cent, and in some cases up to 33 per cent. The turning of curved forms may result in 50 or 60 per cent of loss in shavings. It is obvious that there is a very profitable field for the introduction of closer calculations, better methods, and improved machinery.

It must be recognized that in the production of any given article there is probably an irreducible minimum of waste,

and that attempts to save by methods involving a considerable increase in labor will be those most liable to defeat themselves. All forms of wood waste, even sawdust, are capable of being turned into some form of useful product, yet the use of such material for fuel when it is already convenient to the power plant may be real economy compared with the purchase of coal or electric power at high prices. In other words, an attempt at too close utilization might easily result in still greater loss. This is one side of the case.

On the other hand, it is doubtful whether woodworkers in general scrutinize their methods and machinery with the same care that is given to the prevention of waste in up-to-date establishments in other lines, such as metal-working shops.

Wood is so bulky compared with metal that it gives an impression of relative cheapness not always accurately gauged. Also, wood is easily and rapidly worked and the retention of old-style or worn machinery may appear justified where labor costs are not running so high as to attract attention, although the waste due to inefficient machinery may be in reality excessive. Metals, of course, can be cast and forged in a practically wasteless manner, while wood cannot; yet, in spite of this advantage, the metal-working industries utilize improved machinery and methods and especially the services of production engineers to a much greater extent than woodworkers. Every resource of mechanics and chemistry is given practical trial, and the engineers through their associations diffuse the improved ideas throughout the entire industry. As another example, the meat-packers have for years boasted that they utilize everything but the squeal of the hog. It is probably more than a coincidence that the business success of the great packers and the perfection of their utilization go hand in hand.

The plans and methods of working expensive wood should in reason seek improvement over those which were justified when wood was plentiful and cheap. This applies strongly to the sawmill first of all, for what is done badly there must result in excessive waste thereafter. Careless slabbing, edging, and trimming may be very wasteful. In purchasing, the

species of wood and the grades best suited for the purpose are matters which, if poorly decided, may make all the difference between success and failure. As depletion of the forests advances, changes in specifications must be made to conform with market conditions and still retain needful qualities in the lumber. With poor handling and piling much injury or deterioration may take place.

The purchases should be of thickness which best suit the process, or permit resawing the exact sizes, perhaps without replaning. Better sawing, better planing, the restriction of planing and turning operations to the minimum, the use of built-up stock, all offer avenues for saving which in large establishments may amount to many thousands of dollars a year. Finally comes careful discrimination as to the most advantageous and useful disposal of the waste itself. These highly technical matters warrant the enlistment of the best grade of technical overhead. Other things being equal, the margins of profit to be made through improved utilization will in years to come be a deciding factor in the success or failure of many shops. Following the peak in 1920 the price of lumber has already fallen to a reassuring extent, but the logic of past events indicates that never again will the old low levels be known in America. In other words, the time has come when the practice of scientific economy is not only possible but is an essential to continued business prosperity. Better utilization has become necessary not only in the shops but throughout the range of industries which use wood in any form.

In the building trade, in 1919, where poor supervision existed, conscienceless carpenters were known purposely to cut boards and dimension stuff to create shorts, which they were allowed to take home for fuel. Such practices and the attitude toward the job which they engender are sufficient to account for a high percentage of waste.

The Assistant Director of the Forest Products Laboratory recently asserted that it would be possible to save ten billion feet of timber annually, if the American people would put in general practice what is already known relative to the closer

utilization and preservation of wood. Of this quantity five billion feet could be saved in the mills and shops and the other five billion by extending standard preservative treatment to many of those forms of timber exposed to the weather, such as ties, poles, posts, piles, mine props, shingles, and exposed construction. Ten billion feet is more than one-fourth of the annual lumber cut. As a conservative estimate it would be worth a quarter of a billion dollars. This would not be net gain because of the planning, labor, and preservatives necessary to accomplish the saving. Yet it would be the most practical means of prolonging the service of our rapidly vanishing virgin timber, and bridging the interval of shortage which is now inevitable before American forests can begin, under management, to yield an annual supply approaching satisfaction of the national needs.

Forest Management Required.

The wastage of New York's forest resources, deplorable as it may now appear, was probably no worse than many other Commonwealths have suffered. It was unavoidable because, in the presence of an apparently endless supply, public opinion was not moved to call a halt and could not be educated rapidly enough to check destruction until most of the damage had been done.

Many other communities, not excluding parts of France and Germany which are now well forested, went through similar slow stages of change in their economic viewpoint, and only determined to save and grow timber when they had been forced to do so by the sharp pinch of necessity. But there is an important difference between their situation and ours. They had the abundant natural forests of North America to draw upon, while we no longer have that advantage.

The original forests of New York have been mainly cut over twice or more. The store of forest products our fathers called inexhaustible has shrunk to a rapidly dwindling supply, as shown by the diagram used as a frontispiece.

The unprecedented rise in lumber prices, which reached its peak in March, 1920, has drawn the attention of thinking men to the widespread forest depletion as no amount of assertions and discussions could do. The acute shortage of supply and the widespread discomfort and suffering arising from it will eventually have most beneficial effects, if they result in a wiser management of natural resources hereafter.

It seems obvious that the rising prices of forest products will permit and even compel much closer utilization of wood and more general protection of wooden structures. But economy alone is far from sufficient to supply the needs of the present and the future. There must be vastly greater production. Nature must be aided in every possible way to increase the production of existing forest areas, and there must also be the development of new producing forests on a scale never before attempted by a State.

New York needs a lumber cut two or three times as great as at present, and has forest lands capable of producing it. Without prompt and vigorous action looking to that end the pre-eminence of New York wood-working industries is as uncertain as that of her wood-pulp industry. So long as wood was cheap there was no possibility that business men would turn from the old ways, but the experience which the American people are now going through may be just the stimulus needed to bring about the active practice of forestry on both public and private holdings.

Fortunately, New York State has its future largely within its own hands. The heavy precipitation of her mountainous regions insures dense forests in the future, the composition of which will be determined in part by her foresters, though past lumbering has already resulted in a strong set toward the reproduction of hardwoods rather than white pine and spruce.

Although the productive capacity of the forest soils has in many instances been reduced by fire and erosion, yet the soils themselves are not extensively removed, as in some deforested

lands, and this is an incalculable asset. It has been the custom to speak of standing forests as principal, and the yearly growth as interest. This is a true comparison if the soil is reckoned as a part of the forest. The loss of the timber has not bankrupted New York, for the soil is still there to produce endless dividends of forest wealth. Thus, only the less valuable part of the principal is gone. A tree may grow in a century, but the restoration of soil may require many centuries.

The State is rich in lands suitable for timber production. Out of the total of 29,600,000 acres of available* land surface, 21,700,000 acres constitute the farms. The remaining 7,900,000 acres are forest regions. But within the farms are 4,100,000 acres of woodlots and 2,800,000 additional acres of unimproved lands which probably will find their highest use in growing timber. Hence upwards of 14,000,000 acres, or nearly half the land of the State, is suitable for forest and should eventually be devoted to that purpose. *At present 62 per cent of it contains material which is suitable neither for lumber nor pulp, and furnishes only fuel or acidwood.*

Fourteen million acres of forest, each acre growing 150 board feet per year, would supply about 2 billion feet annually, an amount considerably in excess of the total consumption of the secondary industries as reported in 1912. Such a general and sustained average yield is, of course, a result which the most optimistic would not expect for many decades, as it would represent what might be called at this time ideal conditions of management. Moreover, the areas suitable for forest are not available in their entirety as sources of timber supply, and parts of them should never be made so.

Parts of the Adirondacks, the Catskills, and other forest regions possess such natural attractions that their value for recreational purposes outweighs even the present need for timber. They should be permanent recreation grounds for the people. In addition, such lands as the steep mountain slopes

*About 900,000 acres are reported to be occupied by cities, villages, and roads.

at the headwaters of the Hudson and other rivers should remain covered with permanent protection forests, which may be cut lightly or perhaps not at all.

Years ago the State set aside the Adirondack Preserve and the Catskill Mountain Preserve with these purposes in view. Article 7, section 7 of the State Constitution provides that they shall be forever kept wild forest lands, much like the National Parks of the West. These preserves now contain 1,936,492 acres, or about 15 per cent of the lands suitable for forest. Additional purchases are being made as fast as conditions permit. In the preserves the State has a magnificent forest property. At present no timber may be cut from them either for commercial purposes or improvement, but they are under patrol to protect them from fire and theft, and valuable species are being planted. In 1919 about 5,000 acres were thus reforested. New York may well be thankful that so much has been and is being accomplished. Just what areas in the future will be reserved wholly for recreation or protection, without use of the timber, cannot be determined at the present time. Undoubtedly the State forests will in the long run be largely extended, and will play an important part in the future timber supply, especially of high grade materials.

Large tracts are also owned by lumber companies, which for the most part have not seen fit to handle their lands with a view to another forest crop. There are also a few large privately owned tracts held mainly for recreational purposes, which have received protection by patrol.

Forest management means cutting, as well as planting and protection from fire. The old crop must be harvested to make way for the growth of new timber. It is probable that not more than a small fraction of the forest soil of the State is producing the quantity, species, and quality of wood which would be possible if human intelligence were everywhere directing the latent productive forces of the soil. The best timber, like the best corn, can not be produced without planning, watchfulness, and labor. Moreover, the depletion of the remaining timber is now so far advanced and the productive capacity of the soil

DENSE WOODLAND

The annual growth of wood on a given timbered acre is about the same, whether the stand is crowded or moderately open. A fairly dense stand is good at first, to compel the growth of tall straight trunks, but if allowed to continue will result in a crop of cordwood. This woodland is producing chiefly cordwood and perhaps 40 to 80 feet per annum of saw timber. Properly thinned the growth might be 100 to 200 feet of saw timber plus half a cord of firewood, a year.

is so much reduced that there will unquestionably be a long period of scarcity before even the best methods, applied generally and immediately, could secure a sufficient supply from all the available lands.

Next to the establishment and protection of the State Preserves, the most hopeful thing about the situation in New York is that a very large amount of information relative to the necessity of conservation of the forest wealth has been disseminated by the forest agencies of New York State, as well as by the Federal Government. As a result, the public mind is fairly well prepared for the adoption of proper silvicultural methods both on public and private holdings, as well as for legislation of whatever description may be found necessary to make it possible. More and more education of public opinion is imperative, for, until the public knows the need and the remedy and is stirred to the point where there is not only passive acquiescence but an active demand for the new order of affairs, the present inertia will continue to bar progress.

One of the first things needed is a comprehensive study of forest conditions in the State. New York contains a great diversity of lands under widely varied conditions of culture and use. Some farming soils are forested, some forest soils are farmed, and some soils raise no crop of value because no care has been taken to draw dividing lines between agricultural soils and lands which should be permanently forested.

The highest form of use to which each tract of land ought ultimately to be put, whether farming, woodlot, protection forest, scenic area, or lumber production, can only be determined by Statewide examination of the facts on the ground, comprising soils, slopes, timber conditions, and all other facts pertinent to forestry. Both soils and timber should eventually be mapped and described and the permanent classification of each tract approved by suitable authority. With such a record it will be possible to appraise the stock and direct future forest management to the best advantage, besides furnishing advice of fundamental value to farm owners. In this matter

THIN WOODLAND

Moderately wide spacing is desirable to secure the rapid growth of saw timber; but too open spacing results in loss of growth because there are too few trees. The number of trees and hence the productive power of woodlands are reduced by the grazing and trampling of livestock, and by fires which destroy the spongy leaf-litter and humus and disturb soil and moisture conditions. Fire is the deadliest foe of the forest, even though it merely burns along the ground in leaves and grass. This stand is too thin to produce either timber or firewood to advantage. Livestock and fires should be excluded, and the young growth given a chance to spring up in the openings.

farmers and foresters have a common interest, because the business of each depends upon using the soil to the best advantage.

Possibilities of Farm Woodlots

The increasing scarcity and value of wood, as has been said, now makes conditions more favorable than they have ever been for the taking of active measures to grow timber.

In their woodlots the farmers have in their possession one of the State's most valuable and least developed natural resources. The demand for wood by the industries is from three to five times as much as is now being grown in the State. New York soils are fertile and second-growth forests under proper care develop rapidly. A great variety of native woods of high grade could be supplied from this source with relative ease, and farmers by devoting a part of their winter time to this work could produce a crop of useful, worth-while trees at the maximum rate of growth. Forests are by nature self-perpetuating and yield an unlimited number of crops under suitable care. The College and the State can furnish information and demonstration of the proper methods. In 1920 the "Free Tree Bill" was passed, which provides for the raising of trees by the Conservation Commission and their free distribution to persons desiring to reforest. This is a commendable step and should stimulate planting. There is already sufficient manpower to handle the lands to advantage. In addition to the better utilization of time, the rising price of lumber would be all in favor of the farmer, and it is recognized that stumpage values are moving steadily upward but seldom downward. With this crop there is never the need of sacrificing the profits of a season's toil, because the timber can ordinarily be held without deterioration until the market prices are sufficiently attractive to warrant cutting. That is one thing which most people do not consider in regard to timber lands. Improved timber lands are increased in value as much as the improvement adds to them, regardless of whether the present owner ever cuts the crop.

IMPROVEMENT CUTTINGS

These mature beeches are not increasing in value, but actually deteriorating by reason of fungous diseases. The longer they stand, the poorer their lumber will be; hence they should be cut and marketed at the first favorable opportunity. Their removal will make room for young fast-growing timber, such as red oak, ash, hickory,

New York farm-forests should be permanently supporting wood-manufacturing industries established throughout the State. The small local factories could be completely supplied by the successive cuttings from numbers of woodlots in the vicinity. The woodlot owner would have his dependable market and the factory owner a dependable supply. In competition with outside sources of timber, the farmer has the telling advantage of a short haul and the saving of long-distance freight charges on a heavy and bulky commodity. This saving again appears in giving the factory owner who has dependable local forests an advantage over others of his kind who would be compelled to purchase lumber in distant markets.

If a growth of 150 board feet per acre yearly is assumed as an average for all the State timber lands, the farm woodlot should easily surpass that average because of the more intensive care which can be bestowed upon it and the chances to utilize the local market for all inferior material removed in making improvement cuttings. For lumber, pulpwood, distillation, or fuel, practically every scrap of material cut could be utilized.

Ash, oak, basswood, hickory, and yellow poplar should be grown in the place of less valuable species. Tall, straight, promising trees of the useful kinds should be given ample growing space by the removal of defective or inferior trees which crowd them.

Planting in certain instances is necessary and can profitably be done, but as a rule the more satisfactory and less expensive methods of improvement are thinnings and improvement cuttings on second-growth stands. The old-growth pine and hemlock, largely removed in New York, has been followed by fast-growing hardwood, tall, clean, and of excellent quality. Nature responds quickly to a little guidance, and judicious cuttings will often double the rate of production of high-grade marketable timber.

In 1919 the State paid out over $60,000,000 for timber brought in from other States. There is every reason to believe with the woodlots of the State under an efficient system of

management, one-half of the money now paid out to the South and West for raw material could be kept within the State to enrich local communities. It is certain that the proper handling of the farm woodlots is one obvious step to be taken to bridge the gap between the present deficiency of the timber supply and a production from the State more adequate to its total annual needs. Later, from the force of example and aroused public sentiment, the larger forest areas could be placed under intensive management.

In some counties in days gone by the farmers depended to a considerable extent upon hemlock bark, cut in the winter, for their annual profits. Now much of that industry has gone, but there is a better substitute to take its place. Properly handled, the woodlot will provide the farmer with profitable winter work on his own property, will provide a steadily increasing income for his immediate family needs, and will permanently build up the general prosperity of many a community now disintegrating for the lack of a proper balance of industrial pursuits.

The Need for Action

New York, once the leader in the production of timber, and still the leader in those manufactures using wood as a raw material, is drawing rapidly to the end of her accumulated forest wealth. In support of this statement one need but glance at the production curves shown in the frontispiece, with their ominously steep downward trend. Three or four hundred billion feet — nobody knows how much — of the best virgin timber formed the original forest. We must add to this at least a hundred billion feet of growth during the century in which the mills had their way. Perhaps a half of it all was utilized. The remainder went up mainly in smoke, though age, windfalls, disease, and insects also took their toll. Twenty-six billion feet of sawtimber are still in sight.

The per capita production, which in 1869 was 300 feet per person, in 1918 had shrunk to 30 feet per person.

The lumber cut decreased 59 per cent in the 12 years ending with 1919.

The lumber supplied by the State to its secondary industries decreased 65 per cent in the seven years subsequent to 1912.

Approximately two-thirds of the lumber used in the State is imported.

Because of devastation the forest lands no longer can play their part in supplying the rapidly growing need. Sixty-two per cent of the lands which normally should be producing timber are either denuded or contain only fuel or acid wood. The annual cut, relatively small though it is, is three to five times as great as the amount which the failing powers of the forest areas can produce under present conditions.

The quality and sizes of the material produced are greatly depreciated from the former high standards.

In 1919 New York manufacturers paid approximately $11,000,000 for lumber grown in New York, while the lumber imported cost about $66,000,000.

Sixty-six millions of dollars were sent outside the State for material of which fully two-thirds could be grown to equal or better advantage in New York.

Some of the imported lumber came 3,000 miles by rail. Every mile of hauling added to the cost of finished products.

Every foot of lumber, every cord of pulpwood imported costs more because of this wasteful expenditure of coal and labor in hauling.

Men could no longer afford to build or buy wooden houses, the cheapest form of dwelling.

Newspapers had to restrict operation because of the scarcity of newsprint in a State once famous for its spruce.

Directly or indirectly every commodity of life cost more because of the depleted supply of forest products.

Every citizen paid, and is still paying — and for a long time will continue to pay — an unnecessarily large part of his income for shelter and food and clothing, furniture, fuel, amusements,

and transportation — necessaries and luxuries alike — because the depletion of New York's forests has placed her in an economically dependent situation. She can no longer command one of the fundamental necessities of human existence and happiness.

In 1919, 25 out of 48 industries depending upon wood showed a notable decrease in the amount consumed as compared with 1912.

The number of firms decreased by 35 per cent.

The State-grown wood used was 17 per cent of the total consumption, whereas in 1912 it was 45 per cent.

"From him that hath not shall be taken away even that which he hath." Unless vigorous steps are taken in the near future to increase the supplies from her forests, those manufactures depending upon local supplies of wood must either curtail their activities or migrate to regious having a more dependable supply. Others will no doubt continue operations by increasing their imports, paying constantly increasing prices for their raw material as the supply becomes scarcer, more remote, and more expensive to haul. The finished products will cost more in proportion. The importation of supplies from other States is at best an uncertain reliance, for those sources of supply are themselves rapidly diminishing, not excepting much of the softwoods in the Far West, three thousand miles away. We must have hardwoods, too, and there is no hardwood supply on the Pacific Coast, or in Alaska.

Obviously this is a problem which demands immediate action on a large scale, such as only the full resources of the State can provide and manage. The enlargement of the Erie Canal is a comparable project, as regards the effort needed, the complexity of the problems presented, the probable total cost, and the ultimate benefits to be gained.

The barge canal was in a sense a matter of choice, but reforestation is a matter of sheer necessity. The alternative is to forego the commanding position now occupied in manufactures depending upon wood and the forcing into other work or into unemployment of large numbers of skilled workmen.

Finally, as has been said, there is and there will be, until this problem is solved, an appreciable and increasing addition to the mounting cost of every commodity of life, for directly or indirectly each one is affected by the scarcity of forest products.

Therefore every citizen of the State is directly and vitally concerned to inform himself and to see that suitable action is taken by the State authorities. A comprehensive plan for reforestation should be formulated, agreed upon, and put into execution. Forest laws must be revised and new laws enacted. Better treatment of private woodlands, better methods in logging, milling, and preservative treatment of timber must be required, or there is no hope of prolonging the use of the present-day timber to bridge the gap while the seedlings of today are growing into the merchantable timber of the future. Above all there is need of the driving power of a united public opinion, determined that New York shall not suffer for the lack of forests for all her future needs.

The people who have the most at stake are the manufacturers of wooden products in all lines. Their industries are in a position of increasing difficulty. They have organizations which enable them to present their wishes effectively. They are, or they should be, the best informed as to the reality of the need for action. New York has talked of forest replenishment for fifty years. With every additional year of delay the difficulties and the ultimate losses are multiplying.

Business demanded the barge canal, and saw that it was completed. If business now demands the perpetuation of the State timber supply, it can bring about the conditions which are needed to draw from the forest soils of New York the potential wealth now going to waste.

The war is over. The economic affairs of the States and the Nation must be put upon foundations built broad enough and strong enough for the needs of the greater America yet to come. New York should be the leader in this essential form of economic reconstruction.

PART II

DISCUSSION OF SECONDARY WOODWORKING INDUSTRIES

Summary of Kinds of Wood Used in New York

The following table (Table 1) shows the relative importance of the various species used for making wooden articles in New York. The total for all species amounts to 1,279,795,000 feet annually, for which the manufacturers paid during 1919 a total of $77,786,000, or an average of $60.78 per M. feet. The amount of raw material cut in New York was 189,109,000 feet or approximately 15 per cent of all material used by local wood-using industries. Sixty-five species are listed.

In compiling this report, owing to incompleteness of information furnished, it was considered impracticable to distinguish between the various species of certain genera and the data for such were combined.

Among the native woods white pine contributes the largest amount. Its total of over 329 million feet amounts to 25 per cent of the wood used and more than twice the amount contributed by spruce, the next largest quantity reported for any one species. Note that nearly 306 million feet of the supply was imported from other States. White pine is now and always has been the leading commercial species in New York. When the State occupied first place in the production of lumber, white pine stood foremost among American woods, growing in great abundance throughout New England, the Lake States, and along the Appalachian Mountains. The wood is light, soft, easily worked, comparatively free from resin, and warps and shrinks but little in seasoning. It has all the essential qualities demanded by a large number of wood-using industries, particularly those of sash, doors, blinds, general millwork, pattern work, and general planing mill products. Its

average price of $53.54 is comparatively low for such desirable stock. New York woodlots now contribute only 23 million feet of white pine annually to the wood-using industries of the State.

Spruce ranks second in the order of consumption. Both the red and the white species are common throughout the State, red being the principal one. Its wood is light, soft, stiff, and moderately strong. In the manufacture of pianos and other musical instruments, its resonance or capacity to amplify sound waves makes it one of the most valuable of woods. It is also the most valuable of all woods for paper making on account of its long, strong, light-colored fiber. While red spruce is slightly harder and of slower and more uniform growth than white spruce, the two have the same general mechanical and physical properties and are generally used interchangeably by the various industries without reference to species. Black spruce is a decidedly inferior species sold mixed with the others.

Southern yellow pines include longleaf pine (*P. palustris*), shortleaf pine (*P. echinata*), loblolly pine (*P. taeda*), and slash pine (*P. caribaea*). Pine which came from North Carolina, at comparatively low prices and found use in the industries using cheaper qualities of pine is listed as loblolly pine. All other pine coming from the Southern States, unless it was specifically called loblolly pine, is listed as southern yellow pine and includes longleaf, slash, and shortleaf pines. On account of the lack of information furnished, it was impossible in most cases to distinguish between the longleaf and shortleaf, and these consequently are listed together as southern yellow pine. The total consumption of the southern pines is found to be in practically the same ratio to the total lumber consumption of the State as seven years ago. Seventeen per cent of the lumber consumed in New York is southern yellow pine.

Soft maple comprises red maple (*Acer rubrum*) and silver or soft maple (*Acer saccharinum*). The qualities of these two woods are quite similar and both are mixed and sold with hard maple. Silver maple is stronger and not so brittle as

red maple. Red maple, or scarlet maple as it is sometimes called, is more abundant and found on the market in greater quantities. It reaches its best growth along streams and in low, wet swamps.

The staple demand of the market, however, is for hard or sugar maple (*Acer saccharum*), because this wood has qualities of hardness, strength and stiffness, combined with unusual beauty of grain and capacity to receive finish, which fit it for a very wide variety of uses. No other wood used in New York is reported to be used in so many different industries.

White oak follows maple closely in the amount of wood used. In several industries, such as agricultural implements, vehicles and vehicle stock, white oak is one of the most important species. Its high average price of $93.81 per M. feet f. o. b. factory is evidence of its desirability for most uses. Local woodlots contribute only about 6 million feet, or one-tenth of the total white oak consumed in the State, whereas in 1912 the home-grown supply was over 30 million feet. West Virginia, Kentucky, Ohio, Indiana, and Arkansas supply most of the oak shipped into New York from outside.

Birch includes several different genera: yellow birch (*Betula lutea*), paper birch (*Betula papyrifera*), sweet birch (*Betula lenta*), and gray birch (*Betula populifolia*), which are listed in order of quantity consumed. Yellow birch is by far the most important of these birches commercially, and finds a ready market in a great variety of industries. New York produces over one-half of the birch consumed by her factories, most of which is yellow birch. White or paper birch has qualities of strength, hardness, and closeness of grain similar to yellow birch, but is much lighter in weight and is also whiter. White birch is used mostly for pulleys and brush backs, as reported by New York industries. Gray birch and sweet birch are relatively unimportant but find entrance into the industries in mixture with other genera.

Ash growing in New York consists of several different kinds, but the only two of importance are: white ash (*Fraxinus americana*) and black ash (*Fraxinus nigra*). White ash is

much more valuable and is used to a greater degree than black ash, because of its greater abundance and its wonderful qualities of strength and elasticity. The automobile industry has made exceedingly heavy demands upon the supply of white ash, since its qualities make it an excellent wood for frame and wheel construction. The single industry which draws heavily upon black ash is that of basket making, to which it is adapted because of its ease in separating into thin layers. Other ashes growing in New York, but of little importance, are red ash (*Fraxinus pennsylvanica*) and green ash (*Fraxinus lanceolata*). Over half of the ash used by the industries in 1919 was homegrown and a very large proportion of this was white ash. The ranges of black and white ash overlap throughout the State. In general, the white ash occupies the better-drained lands, and occurs sparsely in the colder swamps, whereas black ash grows generally in the cold swamp land and along water fronts.

Three kinds of elm grow in commercial quantities within New York: slippery or red elm (*Ulmus pubescens*), white elm (*Ulmus americana*), and cork or rock elm (*Ulmus racemosa*). The second and third are by far the most important. Rock elm is harder and more durable than either of the other and is in great demand for certain parts of vehicles, especially for hubs. White elm, however, is in more general use, particularly in the form of rough lumber and for the production of cooperage stock, vehicles, furniture, agricultural implements, and shipbuilding. Red elm is weaker and not generally sought by wood users.

Several species of hickory are indigenous to the State, and their qualities are in many respects so similar that no notice is taken of such differences in the markets. The four species contributing to the New York manufacturing industries are shagbark hickory (*Hicoria ovata*), mockernut (*Hicoria alba*), pignut (*Hicoria glabra*), and bitternut (*Hicoria minima*). The shagbark hickory, locally known as shellbark hickory, is the most important species and is very important in many New York industries, especially for automobiles,

vehicles, and agricultural implements on account of its tough, hard grain and elasticity. The manufacturers import more than two million feet of hickory annually from the central western States, most of which is the shellbark species. The supply of this valuable species is rapidly disappearing.

New York manufacturers use many woods which are not grown within the State. The principal shipments from without, in addition to the southern pines, consist of red gum and cypress. Gum, once considered a weed tree, is now in high demand for furniture and other ornamental uses. Bald cypress (*Taxodium distichum*) is conspicuous in many industries, including boat-building, caskets, and interior finish. It comes generally from Louisiana, but is found in commercial quantities throughout the southeastern United States.

Many woods are imported from foreign nations. Mahogany contributes nearly 12 million feet, most of which comes from Mexico, Central America, the West Indies, and Africa, but a small amount comes from the northern states of South America. Balsa, a relatively new wood in our markets, takes second place in quantity among imported woods. South America supplies this extremely light and rapid-growing wood. It is now used principally in manufacturing life rafts and floats. Experiments are also being tried in its utilization as a heat insulator. Because of the porosity and weakness of this wood, and some difficulties of working and handling it, its field is as yet somewhat limited. Spanish cedar comes from Mexico and Central America for use almost exclusively in the manufacture of cigar boxes.

Circassian walnut comes from southeastern Russia and the adjacent regions of Asiatic Turkey and the Black Sea. Teak comes from India and Siam, and is valued for bearings and ship decking. Ebony is imported from many countries, but the best grades are supplied by Ceylon, India, and Madagascar. Lignumvitae comes from the American tropics, and is very important in the manufacture of mallets, rollers, bushings, casters, and bowling balls. A small amount of satinwood finds

its way into New York factories and is shipped chiefly from India and Ceylon. The chief source of granadilla is Africa, but a few varieties are found in the tropical area of South America. Costa Rica and other points in Central America contribute the small amount of cocobola reported. The last two woods are largely used for knife handles.

Many minor species, such as bamboo, congo, corra, furze, Scotch thistle, weitzel, and whangee are purchased in small amounts by the ton, and the shipments are frequently mixed orders so that the price data and quantities can not be separated. English oak is received in veneer form and the price of $980 per M. feet b. m. makes it the most costly of all woods used in New York except satinwood, which was quoted at the same price. It is a very beautiful wood used in high-grade furniture and interior finish.

TABLE 1

SUMMARY OF WOODS USED IN NEW YORK, BY KINDS, 1919

KINDS OF WOOD		QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Quantity grown in New York. (Feet b. m.)	Quantity grown out of New York. (Feet b. m.)
Common name	Botanical name	Feet b. m.	Per cent				
Total		1,279,795,750	100.00	$60 78	$77,786,690	189,109,000	1,090,686,750
White pine	*Pinus strobus*	329,485,000	25.75	$53 54	$17,640,756	23,569,000	305,916,000
Spruce	*Picea* species	149,373,000	11.67	51 63	7,711,661	20,155,000	129,218,000
Loblolly pine	*Pinus taeda*	112,007,000	8.75	48 86	5,472,961	.....	112,007,000
Southern yellow pine	*Pinus* species	106,688,000	8.34	59 35	6,331,862	.....	106,688,000
Hard maple	*Acer saccharum*	74,481,000	5.82	54 01	4,023,052	47,693,000	26,788,000
White oak	*Quercus alba*	68,879,000	5.38	93 81	6,461,253	5,786,000	63,093,000
Hemlock	*Tsuga canadensis*	53,330,000	4.17	39 96	2,130,984	11,578,000	41,752,000
Birch	*Betula* species	49,249,000	3.85	54 46	2,682,221	27,405,000	21,844,000
Chestnut	*Castanea dentata*	49,079,000	3.83	58 40	2,866,113	1,955,000	47,124,000
Yellow poplar	*Liriodendron tulipifera*	41,375,000	3.23	81 17	3,358,238	293,000	41,082,000
Red gum	*Liquidambar styraciflua*	37,254,000	2.91	76 64	2,855,203	.....	37,254,000
Bald cypress	*Taxodium distichum*	32,416,000	2.53	71 08	2,304,149	.....	32,416,000
Basswood	*Tilia americana*	29,897,000	2.34	54 85	1,639,955	11,347,000	18,550,000
Beech	*Fagus grandifolia*	28,955,000	2.26	36 07	1,044,352	22,947,000	6,008,000
Ash	*Fraxinus* species	21,017,000	1.64	98 47	2,069,508	7,870,000	13,147,000
Western white pine	*Pinus monticola*	14,362,000	1.12	65 69	943,459	.....	14,362,000
Douglas fir	*Pseudotsuga mucronata*	13,340,000	1.04	53 76	717,097	.....	13,340,000
Mahogany	*Swietenia mahagoni*	11,901,000	.93	208 94	2,486,608	.....	11,901,000
Tupelo	*Nyssa* species	7,318,000	.57	68 37	500,326	.....	7,318,000
Elm	*Ulmus* species	7,103,000	.56	42 58	302,420	4,340,000	2,763,000
Red oak	*Quercus borealis maxima*	6,291,000	.49	87 80	552,381	1,050,000	5,241,000
Black walnut	*Juglans nigra*	3,451,000	.27	199 45	688,288	6,000	3,445,000
Soft maple	*Acer* species	3,328,000	.26	59 33	197,448	1,368,000	1,960,000
Red cedar	*Juniperus virginiana*	3,210,000	.25	139 72	448,500	.....	3,210,000
Cottonwood	*Populus* species	3,090,000	.24	48 34	149,366	171,000	2,919,000
Sugar pine	*Pinus lambertiana*	2,774,000	.22	61 10	169,480	.....	2,774,000
Red pine	*Pinus resinosa*	2,650,000	.21	42 92	113,750	20,000	2,630,000
Balsa	*Ochroma lagopus*	2,500,000	.20	110 00	275,000	.....	2,500,000
Hickory	*Hicoria* species	2,370,000	.19	97 85	231,914	314,000	2,056,000
Western red cedar	*Thuja plicata*	2,120,000	.17	53 48	113,370	.....	2,120,000

Spanish cedar	*Cedrela odorata*	1,849,000	.14	179 19	331,331	.....	1,849,000
Black cherry	*Prunus serotina*	1,830,000	.14	71 55	130,935	1,068,000	762,000
Sitka spruce	*Picea sitchensis*	1,766,000	.14	187 57	331,250	.....	1,766,000
Redwood	*Sequoia sempervirens*	1,174,000	.09	80 07	94,005	.....	1,174,000
Sycamore	*Platanus occidentalis*	768,000	.06	67 50	51,840	.....	768,000
Arborvitae	*Thuja occidentalis*	582,000	.05	90 42	52,625	25,000	557,000
Buckeye	*Aesculus* species	374,000	.03	44 03	16,468	.....	374,000
Willow	*Salix* species	354,000	.03	37 03	13,107	4,000	350,000
Witch hazel	*Hamamelis virginiana*	341,000	.03	136 16	46,430	.....	341,000
Western yellow pine	*Pinus ponderosa*	250,000	.02	38 00	9,500	.....	250,000
Southern white cedar	*Chamaecyparis thyoides*	204,000	.02	84 90	17,320	.....	204,000
Port Orford cedar	*Chamaecyparis lawsoniana*	153,000	.01	150 08	22,962	.....	153,000
Lignum-vitae	*Guajacum officinale*	129,000	.01	293 02	37,800	.....	129,000
Persimmon	*Diospyros virginiana*	105,000	.01	123 71	12,990	.....	105,000
Butternut	*Juglans cinerea*	72,000	.01	155 00	11,160	3,000	69,000
Tamarack	*Larix laricina*	68,000	.01	46 84	3,185	.....	68,000
Balm of Gilead	*Populus balsamifera*	65,000	.01	37 00	2,405	.....	65,000
Balsam fir	*Abies balsamea*	59,000	*	39 78	2,347	59,000	.....
Teak	*Tectona grandis*	55,000	*	715 55	39,355	.....	55,000
Black locust	*Robinia pseudacacia*	53,000	*	72 53	3,844	.....	53,000
Dogwood	*Cornus florida*	50,000	*	140 00	7,000	25,000	25,000
Holly (American)	*Ilex opaca*	45,000	*	150 00	6,750	.....	45,000
Applewood	*Malus* species	33,000	*	36 36	1,200	33,000	.....
Rosewood	*Dalbergia* species	30,250	*	396 86	12,005	.....	30,250
Cocobola	*Platymiscium* species	26,000	*	606 73	15,775	.....	26,000
Pitch pine	*Pinus rigida*	25,000	*	35 00	875	25,000	.....
Circassian walnut	*Juglans regia*	17,000	*	508 53	8,645	.....	17,000
Ebony	*Diospyros* species	16,000	*	905 25	14,500	.....	16,000
Satinwood	*Chloroxylum swietenia*	5,000	*	980 00	4,900	.....	5,000
English oak	*Quercus* species	2,000	*	980 00	1,960	.....	2,000
Granadilla	*Brya ebenus*	1,000	*	400 00	400	.....	1,000
Sassafras	*Sassafras sassafras*	1,000	*	21 00	21	.....	1,000
Boxwood	*Buxus sempervirens*	500	*	250 00	125	.....	500
Cork	*Quercus suber*	.....	.....	.....	.....	.....	.....
Rattan	*Calamus* species	.....	.....	.....	.....	.....	.....

* Less than one hundredth of one per cent.

TABLE 1-A

COMPARATIVE STATEMENT OF WOODS USED BY SPECIES IN NEW YORK, 1919–1912

KIND OF WOOD (Common name)	QUANTITY USED				GROWN IN NEW YORK	
	1919		1912		QUANTITY IN BOARD FEET	
	Board feet	Average value per M ft.	Board feet	Average value per M ft.	1919	1912
Total	1,279,795,750	$60 78	1,754,519,217	$30 76	189,109,000	548,236,159
White pine	329,485,000	$53 54	422,688,634	$27 70	23,569,000	158,109,000
Spruce	149,373,000	51 63	169,107,607	21 31	20,155,000	76,162,900
Loblolly pine	112,007,000	48 86	70,596,671	20 77	.....	.....
Southern yellow pine	105,688,000	59 35	194,503,215	28 98	.....	.....
Hard maple	74,481,000	54 01	90,194,650	27 07	47,693,000	56,905,700
White oak	68,879,000	93 81	130,421,577	46 25	5,786,000	30,335,677
Hemlock	53,330,000	39 96	83,028,900	19 82	11,578,000	49,080,400
Birch	49,249,000	54 46	44,136,326	30 07	27,405,000	30,508,032
Chestnut	49,079,000	58 40	71,054,190	28 56	1,955,000	13,627,550
Yellow poplar	41,375,000	81 17	57,016,880	40 47	293,000	5,250,900
Red gum	37,254,000	76 64	41,940,175	29 16	.....	75,000
Cypress	32,416,000	71 08	60,314,370	39 97	.....	.....
Basswood	29,897,000	54 85	53,977,220	27 36	11,347,000	32,621,350
Beech	28,955,000	36 07	42,546,814	20 54	22,947,000	31,492,600
Ash	21,017,000	98 47	17,556,225	38 49	7,870,000	8,369,225
Western white pine	14,362,000	65 69	3,935,000	40 65	.....	.....
Douglas fir	13,340,000	53 76	1,508,600	50 95	.....	.....
Mahogany	11,901,000	208 94	11,208,720	138 84	.....	.....
Tupelo	7,318,000	68 37	1,598,616	39 24	.....	.....
Elm	7,103,000	42 58	17,310,500	28 37	4,340,000	8,300,600
Red oak	6,291,000	87 80	59,868,300	38 49	1,050,000	17,282,050
Black walnut	3,451,000	199 45	2,629,128	117 15	6,000	570,675
Soft maple	3,328,000	59 33	8,960,650	25 71	1,368,000	4,587,400
Red cedar (southern)	3,210,000	139 72	16,766,575	37 98	.....	2,500
Cottonwood	3,090,000	48 34	22,778,000	21 00	171,000	14,508,000
Sugar pine	2,774,000	61 10	1,647,100	46 83	.....	.....
Red pine	2,650,000	42 91	12,420,300	22 99	20,000	140,000
Balsa	2,500,000	110 00	20,000	40 00	.....	.....
Hickory	2,370,000	97 85	8,755,100	43 03	314,000	2,551,150
Western red cedar	2,120,000	53 48	1,245,200	30 85	.....	.....
Spanish cedar	1,849,000	179 19	8,582,500	113 11	.....	.....
Cherry	1,830,000	71 55	3,242,750	46 22	1,068,000	748,050
Sitka spruce	1,766,000	187 57	27,000	49 07	.....	.....
Redwood	1,174,000	80 07	767,700	41 74	.....	.....
Sycamore	768,000	67 50	182,712	37 06	.....	2,700
Arborvitae	582,000	90 42	1,623,600	24 61	25,000	929,700
All other kinds	2,533,750	.....	17,359,712	.....	149,000	6,075,000

Summary of Woods Used in New York by Industries

Table 2 shows the relative demands made upon the species by 44 wood-using industries of the State, the average price paid for the raw material delivered at the manufacturing establishments, and a comparison of the consumption of home-grown and imported woods.

The term industry as here used includes the production of articles that are similar or closely related. Each industry is discussed individually in the pages following Table 2, and the particular articles combined in that industry are enumerated.

Under modern commercial conditions the woodworking plants have been specialized, the various branches of the general art demanding a particular class of machinery, labor, and a certain form of raw material. A study by industries is the only way to point out to woodlot owners where they may most profitably dispose of their surplus timber, in what form they are expected to prepare the raw material for the market, and what kinds of wood may be most profitably grown to meet the requirements of the wood-using establishments in a given locality. A study by industries is helpful to the manufacturers of finished products, in that it enables them to compare their individual operations with the average for all the manufacturers engaged in a particular branch of the trade. The chair manufacturer, for example, can compare the woods used in his own establishment with the reports from other chair manufacturers; he can study the particular use to which each species is put, the form of raw material used, the general physical and mechanical properties of the species used in various factories, and what is being done with the waste. Thus each manufacturer who aided in this investigation may benefit by the cooperation of all and be in a better position to effect economy. A comparison of one industry with another should also result in a benefit to all. The disposal of waste in a large establishment is a matter of growing importance, and the smaller plants are frequently able to utilize much of the

waste about the larger plants. New industries spring up and sometimes they utilize or depend upon the waste of the older industries for their raw material. Small, clear blocks of maple, walnut, birch, mahogany, and other waste woods that are sometimes used for fuel in a city planing mill might be profitably turned into brush and hand-mirror backs at an adjoining establishment. The discussions of the various industries aim to point out the form and source of the raw material needed by the various industries, the uses of the various species, the qualities that recommend them for such uses, the cost of the different woods delivered at the factory, the relative demand made upon our woodlots by the various industries, the form of the waste, and to make some suggestions relative to the practical utilization of the waste.

Table 2 shows the wide range of manufacturing going on throughout the State and the enormous amount of raw material needed annually. No other State has so much capital employed or so many men engaged in the wood-using industries. In nearly all of these industries New York is conspicuous nationally, while in many of them she occupies first position in the matter of raw material consumed and the value of the finished products. While her planing-mill output is exceeded by the output of the more heavily timbered States of the South and West, no other State compares with New York in total consumption of wood for certain classes of finished articles. At the time when the previous edition of this bulletin was published, numerous other States had recently been similarly canvassed. It was therefore possible to draw comparisons between the States which can not be made at the present time. Of the individual industries, however, it is believed that New York still retains leadership in the following: packing boxes, sash, door, and blinds, ship and boat building, musical instruments, boot and shoe findings, matches, and probably numerous others.

The average price of $60.78 paid for the raw material is almost exactly twice what it was in 1912. The reports of the

manufacturers were rendered, however, near the peak of the phenomenal high prices following the war, which have since subsided to a marked degree. Except as a record of an ephemeral period these prices are of little value. They show too great fluctuations to be an index of the permanent advance in cost of material which is slowly progressing.

TABLE 2

SUMMARY OF WOODS USED IN NEW YORK BY INDUSTRIES, 1919

INDUSTRY	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Quantity grown in New York. (Feet b. m.)	Quantity grown out of New York (Feet b. m.)
	Feet b. m.	Per cent				
Total	1,279,795,750	100.00	$60.78	$77,786,690	189,109,000	1,090,686,750
Boxes and crates	324,219,000	25.33	$47.48	$15,394,009	16,492,000	307,727,000
Planing-mill products	230,259,000	17.99	54.33	12,509,017	31,241,000	199,018,000
Sash, doors, blinds, and general millwork	200,504,000	15.67	67.49	13,532,772	13,273,000	187,231,000
Furniture	76,963,000	6.01	80.52	6,197,300	15,828,000	61,135,000
Ship and boat building	62,815,000	4.91	65.52	4,115,727	979,000	61,836,000
Musical instruments	53,569,000	4.18	89.03	4,769,358	16,533,000	37,036,000
Car construction	34,476,000	2.69	59.32	2,045,035	1,335,000	33,141,000
Shade and map rollers	29,946,000	2.34	44.23	1,324,434	2,523,000	27,423,000
Caskets and coffins	29,230,000	2.28	65.41	1,911,838	360,000	28,870,000
Chairs	22,318,000	1.74	58.35	1,302,410	13,073,000	9,245,000
Motor vehicles	20,813,000	1.63	101.08	2,103,699	5,592,000	15,221,000
Agricultural implements	19,064,000	1.49	62.83	1,197,890	6,551,000	12,513,000
Boot and shoe findings	14,705,000	1.15	65.44	962,280	12,465,000	2,240,000
Matches	14,250,000	1.11	52.32	745,500	300,000	13,950,000
Woodenware and novelties	13,745,000	1.07	39.94	548,981	9,270,000	4,475,000
Handles	11,986,250	.94	37.95	454,814	11,293,000	693,250
Refrigerators and kitchen cabinets	11,562,000	.90	71.59	827,767	145,000	11,417,000
Fixtures	10,739,000	.84	85.44	917,587	1,929,000	8,810,000
Professional and scientific instruments	9,754,000	.76	82.47	807,358	534,000	9,220,000
Baskets and fruit packages	8,527,000	.67	35.85	305,746	7,499,000	1,028,000
Vehicles and vehicle parts	7,660,000	.60	89.20	683,270	3,690,000	3,970,000
Dairymen's, poulterers' and apiarists' supplies	7,556,000	.59	37.79	285,578	4,683,000	2,873,000
Tanks and silos	7,471,000	.58	66.65	497,950	632,000	6,839,000
Toys	6,864,000	.54	45.79	314,313	3,195,000	3,669,000
Picture frames and mouldings	6,647,000	.52	83.57	555,474	186,000	6,461,000

Plumbers' woodwork	5,424,000	.43	85.13	461,792	1,170,000	4,254,000
Pumps and piping	4,833,000	.38	46.84	226,388	866,000	3,967,000
Laundry appliances	4,241,000	.33	59.23	251,189	.....	4,241,000
Trunks and suitcases	3,984,000	.31	82.16	327,430	185,000	3,799,000
Cigar boxes	3,295,000	.26	164.66	541,859	.....	3,295,000
Patterns and flasks	3,039,000	.24	75.95	230,809	219,000	2,820,000
Brushes and brooms	2,713,500	.21	43.19	117,208	2,124,000	589,500
Shuttles, spools, and bobbins	2,310,000	.18	42.55	98,280	1,125,000	1,185,000
Electrical machinery and apparatus	2,216,000	.18	70.94	157,209	162,000	2,054,000
Machine construction	1,779,000	.14	53.76	95,644	812,000	967,000
Pulleys and conveyors	1,614,000	.13	53.42	86,221	33,000	1,581,000
Airplanes	1,427,000	.11	230.34	328,693	105,000	1,322,000
Elevators	1,288,000	.10	79.93	102,078	160,000	1,128,000
Clocks	896,000	.07	82.17	73,625	8,000	888,000
Sporting and athletic goods	429,000	.03	74.62	32,010	212,000	217,000
Dowels and skewers	377,000	.03	55.94	21,080	377,000	.....
Firearms	258,000	.02	147.78	38,130	.....	258,000
Whips and umbrella sticks	250,000	.02	50.00	12,500	250,000	.....
Printing material	72,000	.01	87.29	6,285	48,000	24,000
Miscellaneous	3,708,000	.29	72.32	268,153	1,652,000	2,056,000

TABLE 7a

COMPARATIVE STATEMENT OF WOOD USED IN NEW YORK BY INDUSTRIES, 1919-1912

INDUSTRY	NUMBER OF ESTABLISHMENTS CLASSIFIED IN EACH INDUSTRY IN —		QUANTITY OF MATERIAL USED IN BOARD FEET BY EACH INDUSTRY IN —		PERCENTAGE OF NEW YORK STATE GROWN MATERIAL USED IN —	
	1919	1912	1919	1912	1919	1912
All industries	2,142	3,507	1,279,795,750	1,754,519,217	14.78	31.25
Boxes and crates	316	429	324,219,000	370,550,400	5.08	18.03
Planing-mill products	240	667	230,259,000	388,191,660	13.57	47.10
Sash, doors, blinds, and general millwork	411	607	200,504,000	341,277,662	6.62	27.62
Furniture	166	242	76,963,000	104,452,092	20.57	31.32
Ship and boat building	99	141	62,815,000	37,700,500	1.56	13.78
Musical instruments	58	81	53,569,000	58,816,550	30.86	35.84
Car construction	11	20	34,476,000	76,201,900	3.87	4.07
Shade and map rollers	4	6	29,946,000	1,622,500	8.43	15.25
Caskets and coffins	21	21	29,230,000	18,161,000	1.23	3.42
Chairs	33	80	22,318,000	21,612,200	58.58	55.51
Motor vehicles	[1] 74	.....	[1] 20,813,000	.....	[1] 26.87	.....
Agricultural implements	43	67	19,064,000	28,055,600	34.36	33.66
Boot and shoe findings	25	24	14,705,000	22,882,000	84.77	85.40
Matches	3	2	14,250,000	.....	2.11	.....
Woodenware and novelties	59	82	13,745,000	8,364,900	67.44	67.92
Handles	23	44	11,986,250	6,474,979	94.22	91.24
Refrigerators and kitchen cabinets	15	25	11,562,000	12,268,700	1.25	29.36
Fixtures	51	70	10,739,000	20,175,615	17.96	28.49
Professional and scientific instruments	13	22	9,754,000	19,811,800	5.47	8.71
Baskets and fruit packages	47	85	8,527,000	18,007,250	87.94	78.55
Vehicles and vehicle parts	[2] 110	269	[2] 7,660,000	30,633,100	[2] 48.17	36.31
Dairymen's, poulterers', and apiarists' supplies	48	104	7,556,000	39,045,000	61.98	24.76
Tanks and silos	26	49	7,471,000	11,332,950	8.46	12.97
Toys	10	13	6,864,000	2,994,500	46.55	65.50
Picture frames and mouldings	25	33	6,647,000	7,514,450	2.80	26.20

Plumbers' woodwork	4	7	5,424,000	1,787,000	21.57	48.68
Pumps and piping	6	10	4,833,000	9,804,800	17.92	15.37
Laundry appliances	4	20	4,241,000	5,201,340	.....	31.83
Trunks and suitcases	9	12	3,984,000	3,536,000	4.64	34.25
Cigar boxes	13	22	3,295,000	10,115,550	.....	.....
Patterns and flasks	59	55	3,039,000	3,388,300	7.21	29.68
Brushes and brooms	18	19	2,713,500	1,562,500	78.28	75.02
Shuttles, spools and bobbins	3	5	2,310,000	962,000	48.70	77.13
Electrical machinery and apparatus	4	18	2,216,000	4,602,860	7.31	50.08
Machine construction	28	33	1,779,000	4,555,900	45.64	63.30
Pulleys and conveyors	4	4	1,614,000	823,000	2.04	40.70
Airplanes	5	3	1,427,000	31,400	7.36	54.78
Elevators	7	9	1,288,000	2,663,200	12.42	26.21
Clocks	3	3	896,000	2,948,159	.89	5.81
Sporting and athletic	8	19	429,000	4,230,100	49.42	33.18
Dowels	4	8	377,000	753,000	100.00	93.36
Firearms	4	3	258,000	370,000	.....	.....
Whips and umbrella sticks	4	3	250,000	2,237,000	100.00	89.41
Printing material	6	5	72,000	1,737,500	66.67	35.25
Gates and fencing	.....	6	.....	725,500	.....	22.12
Miscellaneous	18	24	3,708,000	31,639,800	44.55	13.16
Excelsior	.....	[3] 36	.....	14,697,000	.....	91.71

[1] Included in vehicles and vehicle parts.
[2] Includes motor vehicles.
[3] Includes thirty-six concerns cutting excelsior, included in Appendix in 1919.

Boxes and Crates, Packing

Table No. 3 includes box shooks, packing boxes, piano and organ shipping boxes, packing crates, and all kinds of material used in the industrial establishments for the storage and shipment of factory products. New York is truly the Empire State in manufacturing, and naturally the demand for boxes and crating is enormous. The total annual output of the box factories in New York amounts to 324,219,000 feet. Among the secondary wood-using industries this one is now first in the State in point of quantity of wood consumed, having surpassed the planing-mill industry by 94,000,000 feet in 1919. Adding the wood material put into "Baskets and Fruit Packages," including baskets proper, berry crates, and packages, the total output of wooden containers comes up to 332,746,000 feet. These combined industries form a true index to the relative importance of New York in manufacturing, leaving out of consideration the cigar and tobacco box industry and the manufacture of cooperage.

Table 3 shows the consumption of 29 different species of wood, the average cost of which delivered at the factory is $47.48 per thousand feet. Boxes and crates can be produced generally from low-grade stock. From the standpoint of wood utilization, this is one of the desirable features about modern manufacturing business. The enormous development of manufactures has naturally resulted in the increased consumption of lower grades of lumber for boxes and crates. Frequently as much lumber is needed to crate a wooden article, such as a piece of furniture, as is used in making the article. The kinds and sizes of boxes and crates are so numerous that discussion of their form is impracticable. Box material is generally consumed in the vicinity of its manufacture, because freight rates discourage long hauls. Some of the Southern States, however, such as Virginia, produce large amounts of box material in the form of shooks that can be shipped in a knockdown form by carloads to great distances.

The differences in the physical and mechanical properties of the various species are not so important in boxes and crates.

Almost any kind of wood can be used in some form or other for crates, the principal recommendation being that it is cheap, light, and capable of holding nails without splitting. Strength, while desirable, is not the first requisite of a box material. In New York, white pine naturally combines all the qualities of good box wood and contributes over 40 per cent of the raw material consumed by this industry. Only 10,000,000 feet of the white pine is grown within the State, while over 120,000,000 feet is now imported. With a few exceptions, the dominant species in any locality contributes most of the material going into boxes. While white pine leads in New York, Wisconsin, Massachusetts, and Michigan, it is noticeable that in other States, like Virginia and North Carolina, southern yellow pine contributes the larger amount to the industry. In Louisiana, where longleaf pine is the principal species, it contributes most to the box industry. In Kentucky and Arkansas red gum leads all others. This utilization of the most abundant species in a community clearly indicates that the industry does not demand special qualities in woods, but utilizes the nearest suitable wood that is cheap and abundant. In New York other important local woods contributing to the industry are spruce, hemlock, basswood, cottonwood, hard maple, beech, birch, chestnut, and elm. Yellow pine is the principal wood shipped into the State for boxes, the contribution amounting to 101,000,000 feet annually. As will be noted, the first five species are softwoods. Softwoods are generally of sufficient strength for shipping cases and have the additional advantages of being light, easily worked, and comparatively free from shrinking and warping. In some respects white pine excels lobolly and shortleaf as a box material. Although not particularly strong, it tends to dent rather than to break or split upon impact. For this reason it was formerly used by the Army for ammunition cases and is now used for shipping cases for Government transits. It is not so resinous and hence is better for shipping foodstuffs; its color, being nearly white, is admirable for the display of brands and firm names on packages; and it is more workable than the other species. New

York woodlots and forests, if properly cared for, will always be important producers of white pine, spruce, hemlock, cottonwood, and the other important species so much in demand by the manufacturing industries of the community. Here is one of the finest opportunities for the sale of small-sized and low-grade timber cut from young plantations in making improvement thinnings. Some of the less important species, such as beech and elm, are very desirable for certain kinds of crating because of greater strength and toughness. Elm crating, when properly secured by metal cleating, is especially satisfactory where strength and toughness are required.

The box industry offers exceptional opportunities for the close utilization of low grades and waste. New England box-board custom is to saw the log through and through. This, of course, is always second-growth material, and consequently they cut it this way. The board is cut into lengths and edged just sufficiently to take off the bark on each side, with the result that many boards are narrow at one end and wider at the other. This practice of making box boards permits the closest utilization possible. Some mills are manufacturing box boards from slabs that would otherwise go to the hog, slasher pile, or refuse burner. Some industries work up veneer cores as box boards. Many industries instead of buying box material or boxes use their otherwise waste pieces or poor ends of the grades for this purpose. All of these expedients save money and permit the use of better lumber for more exacting purposes.

TABLE 3

BOXES AND CRATES, PACKING

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	324,219,000	100.00	$47 48	$15,394,009	16,492,000	307,727,000
White pine	132,286,000	40.80	$49 94	$6,606,363	9,996,000	122,290,000
Loblolly pine	93,814,000	28.94	46 84	4,393,768	.....	93,814,000
Spruce	59,388,000	18.32	46 27	2,747,883	1,200,000	58,188,000
Hemlock	8,098,000	2.50	36 21	293,229	1,065,000	7,033,000
Southern yellow pine	7,348,000	2.27	45 04	330,954	.....	7,348,000
Basswood	4,769,000	1.47	45 81	218,468	964,000	3,805,000
Cottonwood	2,651,000	.82	47 67	126,373	62,000	2,589,000
Red gum	2,371,000	.73	40 62	96,310	.....	2,371,000
Yellow poplar	2,340,000	.72	44 28	103,605	2,000	2,338,000
Hard maple	1,836,000	.57	29 45	54,070	892,000	944,000
Beech	1,429,000	.44	34 22	48,900	1,072,000	357,000
Western white pine	1,418,000	.44	50 54	71,666	.....	1,418,000
Cypress	1,356,000	.42	39 76	53,915	.....	1,356,000
Chestnut	1,169,000	.36	36 57	42,751	342,000	827,000
Birch	914,000	.28	35 42	32,374	635,000	279,000
Red pine	625,000	.19	38 00	23,750	20,000	605,000
Elm	454,000	.14	31 18	14,156	176,000	278,000
Willow	351,000	.11	37 00	12,987	1,000	350,000
White oak	338,000	.10	130 00	43,940	62,000	276,000
Redwood	300,000	.09	60 00	18,000	.....	300,000
Douglas fir	290,000	.09	46 40	13,456	.....	290,000
Tupelo	250,000	.08	43 00	10,750	.....	250,000
Ash	130,000	.04	200 00	26,000	2,000	128,000
Sugar pine	90,000	.02	36 50	3,285	.....	90,000
Balm of Gilead	65,000	.02	37 00	2,405	.....	65,000
Buckeye	60,000	.02	37 00	2,220	.....	60,000
Tamarack	40,000	.01	41 00	1,640	.....	40,000
Soft maple	38,000	.01	19 73	750	.....	38,000
Cherry (black)	1,000	*	41 00	41	1,000	.....

* Less than 1/100 of one percent.

Planing Mill Products

Planing-mill products are those considered as finished upon leaving the planer, such as flooring, ceiling, siding, molding, base boards, and dressed and matched material. Undoubtedly some plain surfaced lumber and dimension stock has unintentionally been included in these returns. A certain amount of such duplication in the returns is unavoidable.

Of the 230,259,000 feet consumed in the planing-mill industry, only 31 million, or 13 per cent, was found to be home-grown. This is in striking contrast to the returns of 1912 which showed 47 per cent of the planing-mill products grown in New York. In the short space of eight years a great change has taken place. No longer are the New York forests supplying even a considerable percentage of the home demand for building material. The total white pine, spruce, and hemlock from New York in 1919 is only one-sixth of the amount supplied from sources within the State in 1912. The amount of these three woods brought in from other States was over 40 per cent greater than in 1912, although the total production of planing mills in 1919 was 40 per cent less.

The planing mills report the use of 31 different species, the average cost of which at the planer was $54.33, an increase of 100 per cent in cost. Of these only 2 are not imported, elm and balsam fir, and these are insignificant in quantity. Out of 13 species indigenous to New York, 7 were imported in quantities greater than the State supplied, while 2 were imported in total. The remaining 4 include hard maple, birch, and beech, and even of these staple hardwoods more was purchased elsewhere than was cut in New York. In 1912 every one of the 13 came in larger quantity from home sources than from outside, and 3 of them came entirely from the State.

White pine is the most popular wood for general house building purposes in this country. It has all the desirable qualities, being sufficiently strong and having a fine, straight grain and even texture. It is also easily worked, comparatively free from shrinking and warping, very light in color, only

slightly resinous and capable of taking paints and oils, and stains well. It should be remembered, however, that white pine is falling off in quality, and that only a small proportion of it now comes from New York.

Spruce is light, soft, straight-grained, of uniform growth, easily worked, and takes paint well.

Hemlock was neglected in lumber operations for many years until the scarcity of other woods caused manufacturers to utilize this abundant species. It is used chiefly for construction work, but it is also valuable for floor lining, siding, and panel work. The wood is strong, straight-grained, and fairly hard. It finishes smoothly and works fairly well. Its tendency to splinter is one feature which has made it unpopular in comparison with pine.

With the steady shrinkage of the supply of northern species has come the increasing reliance upon southern and western species. The southern yellow pines — longleaf, shortleaf, and loblolly — constitute valuable materials for house construction. Longleaf wood is heavy, hard, very strong, straight-grained, compact, very resinous, and is highly desirable for flooring. For interior finish, ceiling, partition, and flooring, longleaf is extensively used where formerly high-grade hardwoods were largely employed.

Shortleaf pine comes from the South Atlantic and Gulf States. It is particularly suited to interior finish and door construction on account of its fine grain and easy working qualities. The so-called North Carolina pine consists mainly of loblolly with an occasional small percentage of the other species of southern pine.

Bald cypress is of great commercial importance in Louisiana and throughout the southeastern United States. It is put to almost every use as an interior trim for houses and is finished in natural color or stained. Containing little resin, it affords a good surface for paint. It is much used for ceiling, wainscoting, panels, and to some extent for flooring. It shrinks and warps but little and is therefore used for drain boards, sinks,

PLANING MILL PRODUCTS

A room finished in Douglas fir. Pan-American Building, Washington, D. C. Although the forests of the Pacific Coast are vast in extent, it is doubtful whether they can bridge the gap until the eastern forests have been restored. No forest is inexhaustible to modern sawmills.

kitchen cupboards, and in places where it is subjected to dampness and heat. For parts of houses exposed to weather it is most serviceable, and as siding it practically wears out before it decays.

From the West, New York receives considerable quantities of the so-called western white pine, which is the yellow pine of the Inland Empire (*Pinus ponderosa*) with a slight admixture of Idaho white pine (*Pinus monticola*). Idaho white pine also appears in New York markets, both separately and as a substitute in the wood sold as eastern white pine.

Douglas fir (*Pseudotsuga taxifolia*) is also coming in increasing quantities from the far West as the supply of southern longleaf becomes more restricted. It is a rather heavy, strong wood, obtainable in almost any reasonable length, and will in future be one of the main market species, if not the most important. It is used for many purposes, from bridge timbers to interior finish.

Redwood, shipped from California, is used largely for interior finish and shingles. It takes stains well and is very resistant to decay. Of the foreign woods, mahogany, teak, and Circassian walnut are used mainly as thin veneers for partitions and panels. Teak at $707 per thousand is the most expensive wood in the list. Black walnut at $203 is the costliest native wood.

The larger planing mills situated in the commercial centers are now saving much material that hitherto was thrown away. Today nearly all establishments sell their shavings and sawdust for one purpose or another, especially for bedding horses, packing ice, and distillation, while the slabs are generally made into moldings; hardwood strips and blocks are converted into novelties, brush backs, mirror backs, etc.; while the softwood ends and strips are frequently turned into articles such as balusters, posts, railings, dowels, hamper covers, slats, and cratings. Basswood ends are resawed into ironing boards, while other hardwoods go into such articles as swinging chairs and dimension stock for all other industries using small pieces. The high price of lumber in manufacturing centers encourages close

utilization and New York establishments should set an example, both in shop economies and in the advantageous disposal of waste.

TABLE 4

PLANING MILL PRODUCTS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	230,259,000	100.00	$54 33	$12,509,017	31,241,000	199,018,000
White pine	84,310,000	36.62	$54 44	$4,589,836	2,775,000	81,535,000
Spruce	49,868,000	21.66	52 95	2,640,511	11,583,000	38,285,000
Hemlock	28,866,000	12.54	40 68	1,174,269	7,739,000	21,127,000
Southern yellow pine	20,679,000	8.98	61 88	1,279,708	.....	20,679,000
Loblolly pine	10,983,000	4.77	58 92	647,118	.....	10,983,000
Hard maple	6,852,000	2.98	49 57	339,654	3,493,000	3,359,000
White oak	5,314,000	2.31	95 25	506,159	555,000	4,759,000
Birch	4,755,000	2.07	38 25	181,879	2,632,000	2,123,000
Western white pine	4,605,000	2.00	69 78	322,237	.....	4,605,000
Cypress	3,303,000	1.44	60 06	198,378	.....	3,303,000
Beech	2,571,000	1.12	35 35	90,885	1,493,000	1,078,000
Yellow poplar	1,964,000	.85	73 46	144,275	40,000	1,924,000
Chestnut	1,770,000	.77	59 68	105,634	228,000	1,542,000
Basswood	1,151,000	.50	48 91	56,295	457,000	694,000
Red pine	1,000,000	.43	45 00	45,000	.....	1,000,000
Douglas fir	910,000	.40	70 55	64,200	.....	910,000
Redwood	390,000	.17	108 00	42,120	.....	390,000
Ash	319,000	.14	36 84	11,752	146,000	173,000
Red gum	250,000	.11	103 33	25,833	.....	250,000
Arborvitae	69,000	.03	50 00	3,450	.....	69,000
Red oak	50,000	.02	87 25	4,363	.....	50,000
Hickory	50,000	.02	52 00	2,600	.....	50,000
Balsam fir	44,000	.01	26 08	1,147	44,000	.....
Elm	41,000	.01	35 00	1,435	41,000	.....
Cherry (black)	36,000	.01	63 33	2,380	15,000	21,000
Mahogany	28,000	.01	196 52	5,503	.....	28,000
Locust	25,000	.01	68 74	1,719	.....	25,000
Western red cedar	25,000	.01	120 00	3,000	.....	25,000
Teak	21,000	.01	707 14	14,850	.....	21,000
Black walnut	8,000	*	203 33	1,627	.....	8,000
Circassian walnut	2,000	*	600 00	1,200	.....	2,000

* Less than one-hundredth of one per cent.

Sash, Doors, Blinds, and General Millwork

New York wood users report the consumption of 34 different species in the manufacture of sash, doors, blinds, and general millwork, with a total annual consumption of 200,000,000 feet, the average cost of which is $67.49 per M. fect f. o. b. factory. This industry overlaps the planing-mill industry to some extent. These factories consume raw material that is one step further removed from the forest, as compared with planing-mill products, and the cost of the raw material is over $13 per M. in excess of the latter industry. Generally the establishments manufacturing sash, doors, and general millwork are located in cities and villages where the raw material comes to them in the form of rough and surfaced lumber, whereas the planing-mill products use a great amount from the logs. General millwork establishments manufacture a great variety of articles, but the most important items turned out are balusters, baseboards, blinds, cabinets, columns, cornice work, doors, grills, mantels, newel posts, porch work, posts, railing, sash, screens, scroll work, shutters, stairwork and window frames.

Workableness and ability to hold its shape, combined with the capacity to take oils and paints well, are the principal requirements of woods that go into general millwork. White pine is unexcelled for this industry and occupies first place. For articles such as balusters, columns, posts, scrolls, and stairwork white pine is used almost exclusively. Its clear grain and the ease with which it may be cut makes it a favorite for scroll and cornice work, and it is preferred above all others by cabinet makers. It occupies a leading position in all of the States where the wood grows and not infrequently it is a leader in contribution to many of the industries in States where no white pine is grown, where it is given preference over all other woods for the manufacture of sash, doors, blinds, and patterns. Its desirability as compared with most native woods of other communities for general millwork is patent when more of it is consumed in many States than of native woods. Next to the white pine comes bald cypress of which nearly 20 million feet were

used. It is particularly suitable for construction where resistance to decay is of importance.

Third comes southern yellow pine, embracing longleaf and shortleaf. Longleaf pine is used extensively in doors, especially for the panels on account of its ornamental grain, though a solid longleaf door would be too heavy for convenience. It would take two men to hang it. Therefore, shortleaf and white pine are used more extensively than longleaf in door construction. Frequently longleaf is combined with white pine in the same door, the white pine forming the rails and stiles. Immense quantities of southern pine are made into sash and doors, while smaller quantities are used for railing, balusters, stairs, newel posts, and columns. Because of their hardness, sugar maple and longleaf pine are favorite woods for doorsills.

Hemlock, a native species, is fourth in importance, and here again the ominous condition is seen that the State produced only about one-seventh of the amount consumed in 1919. Hemlock, like spruce, is in heavy demand for pulpwood.

Yellow poplar has come up from tenth place to fifth, and this may be taken as a tribute to its pleasing appearance and workable qualities. It is frequently preferred for columns, newels, and screen frames.

White oak is used largely for high-grade finish, such as mantels, on account of its beautiful grain. It is capable of taking a high polish and when quarter-sawed it has a conspicuous "silver grain," which makes it most attractive for exterior parts of interior finish. Unless seasoned with care it checks and honey-combs badly, but next to mahogany it is considered by many to be the most beautiful wood for interior finish.

Red gum, imported from the Central Southern States, is extremely popular because it can be made to take a beautiful finish, especially in imitation of Circassian walnut. The raw material comes into the State at prices that compete with local woods, and it is used in nearly all of the larger hotels and apartment-houses in one form or another as decorative material. Red gum was formerly considered a weed tree or practically so, until lumbermen learned how to dry it by special methods which overcame its tendency to warp and twist. It is now so

valued that in order to use it to the best advantage large quantities are made into veneers for ornamental work.

Many woods give evidence of their suitability for certain uses in this industry by coming extreme distances, among them being Douglas fir from the northwest, sugar pine from southern Oregon and California, western white pine from the Inland Empire, and Western red cedar from Washington. Mahogany, Circassian walnut, and other high-priced foreign woods are brought from the ends of the earth for the ornamentation of interior trim, carvings, cabinets, etc.

Mahogany is a favorite wood for revolving doors in large hotels and office buildings. The hard foreign woods such as ebony, rosewood, and teak take a high polish and are made largely into carvings for interior decoration. Mahogany, Circassian walnut, English oak, and white oak are used largely in the form of veneer, with chestnut and yellow poplar for backing or cores. Chestnut is used principally, however, for interior finish and for doors. Western white pine (P. *ponderosa*), sugar pine, and Idaho white pine (P. *monticola*) go largely into sash and doors. Cherry is in great demand for casings and cabinets. The large amount of birch consumed is indicative of a very wide range of uses, but it is generally used in connection with mahogany as an interior finish.

Several woods, including elm, pitch pine, arborvitae, and hickory appear to be rather out of place in this industry because their special qualifications are not those of workability, beautiful grain, and capability to take a high finish; but their presence in small amounts is accounted for by the wide range of the industry, including everything from the repairing of porches in humble cottages to the finishing touches on the most expensive grills in New York City.

This industry more closely utilizes waste than general planing mills located in rural districts. In the large commercial centers the general millwork establishments have very little waste, selling their sawdust, kindling wood, and shavings, and manufacturing very small articles. The best waste lumber is made into cores or fillers for veneered doors, while small strips are made into mouldings, dowels, lattice, etc. Small blocks

are turned into brackets, corners, base blocks, carvings, novelties, and brush and mirror backs.

The contribution of New York's forests and woodlots to this industry, which in 1912 was 27 per cent, has fallen in 1919 to less than 7 per cent. Although the total quantity of material used was only about 60 per cent of the amount used in 1912, the cost to the manufacturers was increased by two million dollars, owing to the fact that the average cost per thousand had increased a little over 100 per cent in the period closely following the world war.

TABLE 5

SASH, DOORS, BLINDS, AND GENERAL MILLWORK

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	200,504,000	100.00	$67 49	$13,532,772	13,273,000	187,231,000
White pine	44,689,000	22.28	$60 60	$2,708,153	4,411,000	40,278,000
Cypress	19,707,000	9.83	75 38	1,485,514	.....	19,707,000
Southern yellow pine	16,759,000	8.36	58 06	973,028	.....	16,759,000
Hemlock	15,332,000	7.65	40 45	620,179	2,163,000	13,169,000
Yellow poplar	14,849,000	7.41	87 74	1,302,851	5,000	14,844,000
White oak	14,607,000	7.29	106 34	1,553,308	883,000	13,724,000
Spruce	13,932,000	6.95	51 56	718,334	361,000	13,571,000
Red gum	11,044,000	5.51	68 37	755,078	.....	11,044,000
Chestnut	9,040,000	4.46	73 56	664,982	420,000	8,620,000
Birch	8,504,000	4.25	74 67	634,994	2,018,000	6,486,000
Tupelo	6,025,000	3.00	63 20	380,780	.....	6,025,000
Loblolly pine	5,279,000	2.63	62 07	327,668	.....	5,279,000
Hard maple	3,966,000	1.98	41 00	162,606	648,000	3,318,000
Douglas fir	3,391,000	1.69	62 89	213,460	.....	3,391,000
Basswood	3,031,000	1.52	50 86	154,156	929,000	2,102,000
Sugar pine	2,622,000	1.31	60 70	159,155	.....	2,622,000
Western white pine	2,507,000	1.25	81 54	204,421	.....	2,507,000
Soft maple	2,085,000	1.04	66 25	138,131	1,083,000	1,002,000
Ash	667,000	.33	53 68	35,805	82,000	585,000
Beech	633,000	.32	40 70	25,763	233,000	400,000
Mahogany	589,000	.29	254 74	150,042	.....	589,000
Red oak	510,000	.26	132 63	67,641	.....	510,000
Cherry (black)	243,000	.12	167 41	40,681	10,000	233,000
Southern red cedar	150,000	.08	110 00	16,500	.....	150,000
Black walnut	125,000	.06	178 23	22,279	.....	125,000
Redwood	103,000	.05	75 00	7,725	.....	103,000
Western red cedar	35,000	.03	120 00	4,200	.....	35,000
Pitch pine	25,000	.02	35 00	875	25,000	.....
Butternut	25,000	.02	74 00	1,850	.....	25,000
Witch hazel	16,000	.01	75 00	1,200	.....	16,000
Elm	10,000	*	46 20	462	2,000	8,000
Arborvitae	2,000	*	200 00	400	.....	2,000
Hickory	1,000	*	51 00	51	.....	1,000
Circassian walnut	1,000	*	500 00	500	.....	1,000

* Less than one-hundredth of one per cent.

Furniture

The furniture industry in the State is extremely important, ranking all but the three general industries of boxes, planing mills, and sash, doors, and general mill-work. The kinds of furniture referred to in Table 6 include cabinets, bookcases, chests, bed frames, dressers, chiffoniers, couches, folding beds, davenports, desks, china cabinets, toilet cabinets, buffets, file boards, tool chests, general bedroom furniture, sideboards, tables, table pedestals, wardrobes, divans, cradles, stretchers, filing cabinets, desks, office, bank and store furniture, library, school, and college furniture.

Furniture calls for a great variety of woods of good quality. No industry better illustrates the natural location of wood-working establishments within a State capable of producing the raw materials needed. Most of the 29 species reported can be grown locally. The idle lands of the State could be producing this raw material. This report, however, shows but one quarter of the material as home-grown.

White oak still holds the leading place, as in 1912, in quantity consumed. The wood is strong, hard, with very large pith rays, giving a conspicuous "silver grain" when quarter-sawed. A good deal of white oak enters the furniture trade as quartered stock. Although white oak is preferable in many respects to red oak, since it is less porous and therefore lends itself better to finishing processes, that feature is seldom considered by the ultimate purchaser. Considering the same grades, there is very little difference in price between these two species.

The importance of red gum in the furniture trade is shown by its rise from ninth to second place. Red gum both as plain and quarter-sawed stock is frequently used for imitation mahogany and walnut which are now much in demand. Gum is also used as a core wood for mahogany veneer facing. The average cost of $81.65 per thousand, which is high in comparison with other native hardwoods of similar grade, shows the demand for this wood, once considered a poor material, and also the marvelous way in which it has succeeded in competition with other vanishing species.

Birch, while now taking third place in quantity used, contributes a slightly larger amount than in 1912. New York, however, is supplying a much smaller quantity than seven years ago. This seems strange because birch is one of the principal New York hardwoods. Birch is a splendid wood for furniture and is comparatively cheap, as shown in these tables, because some plants own their stumpage. Its popularity over some other high-grade woods is largely due to the fact that it is used in veneers for imitating mahogany. Birch might well be called a companion of mahogany in the furniture and fixture trade.

Beech has risen to a point of greater importance than formerly in the furniture industry, contributing a large amount at the remarkable price of $29.86. This low figure is due to the fact that such a large amount of the material is home-grown and owned in part by the manufacturers.

Hard maple has lost considerable ground in the furniture trade. Nearly twice as much is imported as is produced in New York. Wisconsin and Michigan supply much maple and birch to this trade. The grain of maple is fine and compact, sometimes containing curly or speckled pith-flecks giving the effect known as birdseye maple. The wood has a satin-like luster, and when cut into veneers is one of the most beautiful of our native species. It is especially attractive as bedroom furniture.

The demand for mahogany-finished furniture in the larger centers, such as the metropolitan district, is exceedingly great. Birch, maple, and gum are frequently stained to represent mahogany.

Yellow poplar is used principally for backing and cores. Drawer bottoms and sides are made chiefly from basswood, red gum, and yellow poplar, while drawer fronts use sugar maple, walnut, oak, birch, and cherry. Mahogany, Circassian walnut, teak, and English oak are the foreign woods entering this industry. These are all very beautiful woods and capable of taking a high polish.

The average price of $80.52 per thousand is rather high in comparison with the other industries. This fact is accounted

for by the high grade of stock required and the fact that some furniture stock enters the factory in dimension form.

In addition to the 76,963,000 feet cut up by the furniture trade, a considerable number of million surface feet of hard veneers are used in furniture. This quantity has not been added to the tabulation, which shows only lumber. Birch, gum, oak, mahogany, and black walnut are the important veneers, which form the surfaces of our most expensive furniture.

Inferior species and grades enter the trade as core stock and backing. Some of the quantities reported in the table are used for frames, braces, drawer bottoms and sides, and other invisible parts, using poor stock. "Built-up" (laminated or veneer) material not only gives a rare beauty of grain and figure but makes a stronger article, which is lighter, less liable to warp or split than a solid piece, and at the same time uses inferior pieces to advantage. The use of built-up stock is increasing to a large extent not only because of the call for stronger material, but also on account of the necessity of closer utilization.

Wormy chestnut is no doubt the species used to the greatest extent as core wood, because the small holes in the chestnut which make it unsightly for exterior use, give extra holding strength to the glue, and for that reason are actually a desirable feature.

A few concerns in New York devote most of their time to the manufacture of built-up panels which are utilized by the furniture and fixture trades to a large extent.

The number of firms reporting in 1919 is 31 per cent less than in 1912. The total consumption of lumber by this industry has decreased 26 per cent. These figures seem to indicate that the industries though smaller in number are individually of about the same size as to lumber consumption. New species entering into the industry are witch hazel, hickory, arborvitae, and teak.

One correspondent wrote that on account of the increased cost of labor, power, and rent it had been necessary to discontinue practically all of his manufacturing from raw

material and to work upon completed or semi-completed furniture imported from other States. This was an instance illustrating the effect of the war combined with the excessive price of hardwoods, which cost almost 100 per cent more in 1919 than in 1912. A few months later, in February, 1920, gum was sold at $195 per M. and quartered oak at $400 per M. wholesale. Yet there was no great decrease in the demand for luxury products. The main problem of the dealers was to obtain the goods.

TABLE 6

FURNITURE

Kind of Wood	Quantity Used Annually		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	76,963,000	100.00	$80 52	$6,197,300	15,828,000	61,135,000
White oak	14,484,000	18.82	$104 92	$1,519,661	$435,000	14,049,000
Red gum	12,530,000	16.28	81 65	1,023,070	.....	12,530,000
Birch	10,393,000	13.50	52 48	545,525	4,944,000	5,449,000
Chestnut	9,297,000	12.08	49 06	456,111	94,000	9,203,000
Beech	6,175,000	8.02	29 86	184,385	4,689,000	1,486,000
Hard maple	4,987,000	6.48	52 23	260,471	3,242,000	1,745,000
Mahogany	4,398,000	5.71	204 96	901,414	.....	4,398,000
Yellow poplar	4,250,000	5.52	52 94	224,995	22,000	4,228,000
Black walnut	2,512,000	3.26	215 71	541,864	2,000	2,510,000
Basswood	1,534,000	1.99	57 62	88,389	890,000	644,000
Southern red cedar	1,000,000	1.30	125 00	125,000	.....	1,000,000
Spruce	931,000	1.21	43 47	40,471	331,000	600,000
Soft maple	820,000	1.07	43 91	36,006	183,000	637,000
Elm	812,000	1.06	46 46	37,726	271,000	541,000
White pine	730,000	.95	45 02	32,865	378,000	352,000
Ash	574,000	.75	67 50	38,745	186,000	388,000
Southern yellow pine	560,000	.73	65 00	36,400	.....	560,000
Red oak	543,000	.71	68 39	37,136	100,000	443,000
Cherry (black)	223,000	.29	92 12	20,543	46,000	177,000
Witch hazel	60,000	.08	475 00	28,500	.....	60,000
Cypress	53,000	.07	71 13	3,770	.....	53,000
Buckeye	37,000	.05	45 00	1,665	.....	37,000
Hemlock	15,000	.02	27 50	413	15,000	.....
Arborvitae	12,000	.02	91 66	1,100	.....	12,000
Circassian walnut	11,000	.01	475 00	5,225	.....	11,000
Loblolly pine	10,000	.01	65 00	650	.....	10,000
Butternut	8,000	.01	180 00	1,440	.....	8,000
Teak	2,000	*	900 00	1,800	.....	2,000
English oak	2,000	*	980 00	1,960	.....	2,000

* Less than one-hundredth of one per cent.

Ship and Boat Building

Ship and boat building is another important wood-using industry in the State, the consumption of nearly 63 million feet for this purpose placing this branch of trade seventh from the top when considered from the standpoint of quantity of wood consumed annually. New York is normally the leader among the shipbuilding States. Possessing the finest harbor in the world and with the Hudson and other large rivers, the Barge Canal, and the Great Lakes supplying water transportation for passengers and freight from border to border, it is not strange that such craft, ranging in size from enormous battle cruisers and palatial passenger steamers to the innumerable and expensive private yachts, are the product of her shipyards. In fact there is every reason why ship and boat building in this State should stand at the forefront.

In the table southern yellow pine (mainly longleaf) leads, contributing over 50 per cent of the raw material used in the industry. This wood goes largely into ships, its availability in large structural sizes, its strength and hardness recommending it above homegrown woods. White oak is used in large quantities (especially at this period) in construction of wooden shipping for the U. S. Shipping Board. Douglas fir comes entirely across the continent to supply ships with spars, while mahogany, teak, Circassian walnut, lignum-vitae, and balsa (cork) wood are imported from foreign countries, the balsa being important in the equipment of boats with life preservers. The foreign woods are generally used for decorative parts of ships and yachts, but not always so. Lignumvitae, for example, is used for steering wheels, tackleblock wheels, and pulleys. Teak is a fine material for wooden decks, as is also white oak, but neither of these woods has been easily obtainable in recent years in lengths desirable for the purpose. Douglas fir is being used as a substitute, as well as southern yellow pine. For this purpose, as well as for planking, the hard pine is preferred to the softer fir because it resists denting better.

For small craft, such as rowboats, the southern white cedar is considered the finest of woods, because it is light, can be

struck without serious indentation, resists decay in contact with water, and finishes well. Its capacity to resist splintering when bumped is important.

Ship and boat building is an industry in which substitution has been going on steadily. In larger vessels steel and iron have taken the place of wood to a great extent. For pleasure boats of less than 80 feet in length, however, wood is preferred.

TABLE 7

SHIP AND BOAT BUILDING

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m)
	Feet b. m.	Per cent				
Total	62,815,000	100.00	$65 52	$4,115,727	979,000	61,836,000
Southern yellow pine	32,342,000	51.49	54 86	$1,774,282	.....	32,342,000
White oak	9,838,000	15.66	76 09	748,573	676,000	9,162,000
Douglas fir	6,200,000	9.88	43 28	268,336	.....	6,200,000
White pine	4,399,000	7.00	85 72	377,082	209,000	4,190,000
Spruce	3,207,000	5.11	59 09	189,502	8,000	3,199,000
Balsa	2,500,000	3.99	110 00	275,000	.....	2,500,000
Western white pine	752,000	1.20	82 91	62,348	.....	752,000
Sitka spruce	500,000	.80	92 50	46,250	.....	500,000
Cypress	493,000	.79	88 61	43,665	.....	493,000
Ash	325,000	.52	168 68	54,821	.....	325,000
Yellow poplar	320,000	.51	157 23	50,314	.....	320,000
Mahogany	292,000	.47	214 14	62,529	.....	292,000
Loblolly pine	285,000	.46	67 74	19,306	.....	285,000
Arborvitae	258,000	.42	88 85	21,923	25,000	233,000
Southern white cedar	204,000	.33	84 90	17,320	.....	204,000
Port Orford cedar	150,000	.24	150 00	22,500	.....	150,000
Chestnut	146,000	.23	41 81	6,104	4,000	142,000
Birch	115,000	.18	100 00	11,500	40,000	75,000
Hard maple	102,000	.16	58 27	5,944	5,000	97,000
Hickory	83,000	.13	116 66	9,683	1,000	82,000
Hemlock	53,000	.08	45 00	2,385	.....	53,000
Elm	40,000	.06	48 00	1,920	.....	40,000
Sugar pine	34,000	.05	101 18	3,440	.....	34,000
Butternut	33,000	.05	225 00	7,425	3,000	30,000
Teak	32,000	.05	709 52	22,705	.....	32,000
Western red cedar	30,000	.04	95 65	2,870	.....	30,000
Locust	23,000	.03	75 00	1,725	.....	23,000
Southern red cedar	20,000	.03	90 00	1,800	.....	20,000
Tamarack	18,000	.02	52 50	945	.....	18,000
Basswood	10,000	.01	170 00	1,700	5,000	5,000
Lignum-vitae	6,000	.01	300 00	900	.....	6,000
Red oak	2,000	*	200 00	400	.....	2,000
Cherry (black)	2,000	*	175 00	350	2,000	.....
Black walnut	1,000	*	180 00	180	1,000	.....

* Less than one-hundreth of one per cent.

Small steel vessels are stiff and vibrate so badly that they are much less comfortable for passenger service.

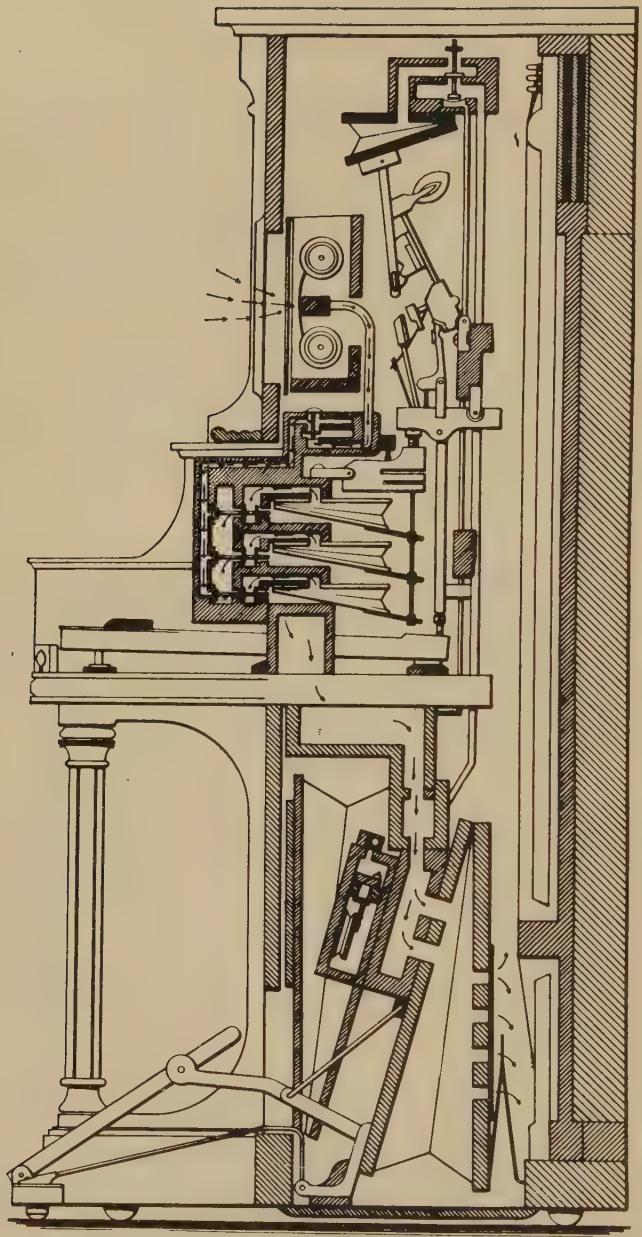
The fact that 34 species are shown in Table 7 is evidence of the varied kinds of water craft produced in New York. Only one-ninth of the raw material is home grown, but this is partly accounted for by the location of the leading plants along New York harbor where shipments by water are very economical from South Atlantic ports, and the exacting nature of some of the requirements. It should be noted that this report was subsequent to the rush period of the World War, during which a much larger quantity of timber and lumber was consumed in construction of the wooden fleet of the U. S. Shipping Board and extension of docking.

Musical Instruments

It is not generally realized that New York is the leading State in the production of musical instruments, her consumption of wood for this purpose being about double that of her closest competitor, Massachusetts. In 1912 the relative standing of the leading States was as follows:

	Feet
New York	58,816,550
Massachusetts	27,463,412
New Jersey	15,582,316
Michigan	12,274,010
Connecticut	11,811,927
Kentucky	8,643,000
Ohio	8,583,000
Pennsylvania	2,945,000

All other States are insignificant in output compared with those named. While the factories of New York produce many kinds of instruments, such as accordions, banjos, drums, flutes, guitars, harps, mandolins, music boxes, phonographs, and violins, the great bulk of wood consumed goes into piano and organ cases and action parts. New York City, Buffalo, North



ARRANGEMENT OF PARTS IN A PLAYER PIANO

This complicated musical instrument would not be possible if there were no wood. Can you imagine a concrete violin or a cathedral organ built of steel? This world would be a much less enjoyable place without music. Wood is essential to human happiness.

Tonawanda, Rochester, Syracuse, and Utica, are among the important centers of piano and organ manufacture.

The number of active plants in the State is very small compared with the number of firms engaged indirectly in the production of instruments. This is because one active plant, such as a large producer of action parts, will sometimes supply scores of firms with its output. Likewise, one large plant manufacturing piano cases will supply a large number of wholesale assemblers. The piano industry is specialized and the firms engaged in the business are mainly manufacturers of one part of the instrument, such as action, case, or sounding board, while the great majority of wholesale firms are only assembling establishments. New York is also the headquarters for a large number of corporations that have active factories in other States and whose consumption of wood is not included in this study.

Sugar maple is the leading species and contributes over one-fifth of the raw material, one-half of which species is reported as homegrown. It is one of the high-grade woods required by the industry, and no doubt its local abundance is one of the reasons for the concentration of the industry in the State.

The industry consumes a great variety of woods, but most of them are used to meet the various styles in cases. Such woods as maple, chestnut, white oak, mahogany, birch, walnut, cherry, rosewood, satinwood, Circassian walnut, and others are largely used in the form of veneer for outside finish and give a great variety of styles. Some woods, however, are used because of their special qualifications for certain parts. Spruce, for example, is perhaps the most resonant of woods, and its capability of amplifying sound makes it the most valuable wood for piano sounding boards, organ pipes, and ribbing on smaller instruments, such as guitars and mandolins, as well as for essential parts of violins. One violin maker stated that in order to get old, well-seasoned spruce he was in the habit of buying spruce timbers from old buildings which were being torn down. Rosewood and other foreign woods in the form of veneer are important, supplying much of the material used in guitars and mandolins. Sugar maple and yellow poplar strips

are in great demand for banjo necks. White pine is not conspicuous here as in other industries, but a small amount is used for pipes of church organs and bottoms of piano keys. Red gum and sugar maple are especially suitable for action parts and a very large amount is used in this way. White ash, white oak, and red oak, in addition to service for framework of larger instruments, are used for keyboards. White pine also appears in keyboards, maple in bridges and bottoms, gum for cores and trim, yellow poplar for cores and edgings, and spruce for bar stock. Basswood is a favorite for keys, birch is used for key-rails and hammers, beech, elm, and Douglas fir for backs of pianos and organs and small instruments, and beech for bottoms. Mahogany is prominent in the industry, contributing 4,000,000 feet board measure. Its use is very general for veneering in all industries and this amount of lumber represents probably 80,000,000 feet, superficial measurement. One large importing establishment in New York reports a local consumption of several million feet of mahogany logs. This enormous quantity of mahogany is converted largely into standard veneer 1/24 to 1/28 of an inch thick, and much of it goes into the piano and furniture industries in the States of New York, New Jersey, Connecticut, and Massachusetts.

In the recent development of the phonograph business great numbers of these instruments are built by the musical instrument factories, often on the same floors with pianos. Built-up panels and veneer are consumed in vast quantities in this branch of the industry. Practically all of the sounding boards for this industry are furnished by two factories in the Adirondacks. Eastern spruce is as good if not even better than western spruce for sounding boards, as its ring grain is more even. Although western spruce can be obtained in greater widths, narrow strips are preferred, consequently eastern spruce meets this need with the utmost satisfaction. One of the best developed machines in the wood-working industry is found in the plants manufacturing piano parts. Strips of wood are fed in the form of molding and after a series of operations the material comes out at the other end of the machine worked into

delicate piano parts. Other industries could profitably introduce specialized machinery such as this on account of the great saving in labor effected and the interchangeability of the finished parts which constitute the product.

Among the more striking features of Table 8 are the enormous amounts of raw material consumed, the variety of woods used, and the relatively large proportion of home-grown woods used. Next to planing-mill products musical instruments consume more material from our own woodlots and forests than any other industry in the list. The annual use in 1919 was

TABLE 8

MUSICAL INSTRUMENTS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	53,569,000	100.00	$89 03	$4,769,358	16,533,000	37,036,000
Hard maple	11,228,000	20.96	$66 31	$744,529	5,736,000	5,492,000
Spruce	8,767,000	16.37	88 23	773,512	5,980,000	2,787,000
Yellow poplar	8,213,000	15.34	89 19	732,517	37,000	8,176,000
Chestnut	7,053,000	13.13	56 79	400,540	238,000	6,815,000
Red gum	5,256,000	9.82	97 11	510,410	.....	5,256,000
Mahogany	4,172,000	7.78	208 73	870,822	.....	4,172,000
Birch	3,891,000	7.26	62 34	242,565	2,958,000	933,000
White pine	1,443,000	2.69	84 69	122,178	786,000	657,000
White oak	1,181,000	2.22	154 40	182,346	.....	1,181,000
Beech	662,000	1.24	64 68	42,818	545,000	117,000
Elm	484,000	.90	69 41	33,594	100,000	384,000
Basswood	353,000	.66	85 74	30,266	103,000	250,000
Sitka spruce	200,000	.38	92 50	18,500	.....	200,000
Ash	183,000	.35	83 18	15,222	12,000	171,000
Redwood	89,000	.17	49 12	4,372	.....	89,000
Black walnut	78,000	.15	134 09	10,459	1,000	77,000
Soft maple	70,000	.13	50 71	3,549	37,000	33,000
Loblolly pine	65,000	.12	46 46	3,020	.....	65,000
Cherry (black)	56,000	.11	140 00	7,840	.....	56,000
Douglas fir	43,000	.08	81 84	3,519	.....	43,000
Western red cedar	30,000	.06	110 00	3,300	.....	30,000
Witch hazel	23,000	.04	66 52	1,530	.....	23,000
Rosewood	10,000	.02	900 00	9,000	.....	10,000
Sugar pine	8,000	.01	200 00	1,600	.....	8,000
Holly (American)	7,000	.01	150 00	1,050	.....	7,000
Cypress	3,000	*	65 00	195	.....	3,000
Red oak	1,000	*	105 00	105	.....	1,000

* Less than one-hundredth of one per cent.

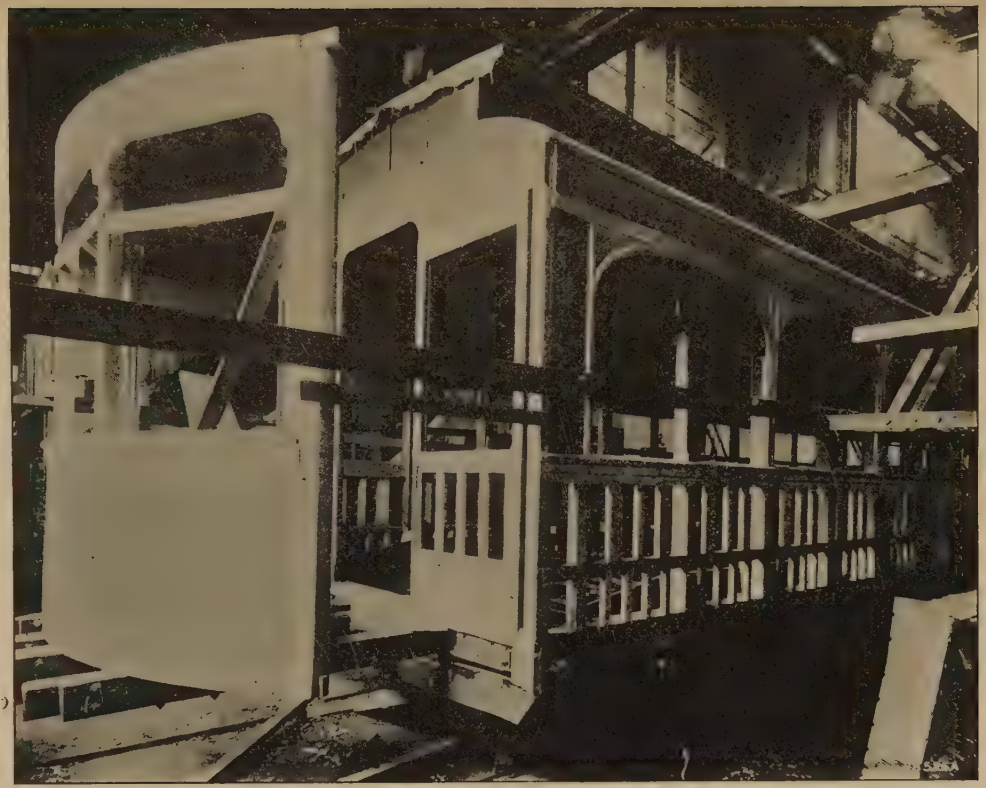
over 16,000,000 feet of local raw material. The average price for the whole industry, $89.03 per thousand, is only exceeded by eight other industries in the State and is indicative of the high class of material demanded for musical instruments.

There is no great waste in the factories. While only the clear stock free from all defects can be used, most of the small ends and blocks can be utilized. Yellow poplar, maple, and gum waste generally can be turned into small parts for interior of pianos, while the waste from the dimension stock of the high-grade woods is used for ornaments, carvings, corners, moldings, etc. The cost of assorting is the great obstacle to economically handling such waste for the production of some valuable by-product.

Car Construction

Car construction is one of the most important wood-using industries in the State. It ranks seventh in the list of industries reporting and consumed 34,476,000 feet of lumber and dimension stock. The wood is used in the manufacture and repair of freight, passenger, Pullman, and baggage cars, and in the cabs of locomotives. Several large railroads have important establishments and repair shops within this State. Some material entering the repair trade comes direct from the mill all worked and is consequently not reported in this industry but has been included with planing mills and general mill work. A large amount of material, especially in dimension form, is used in the maintenance of way; none of this material is reported in this table.

Southern yellow pine contributed about two-thirds of all wood entering this important industry at an average cost of $63.86 per thousand or about $4.50 per thousand less than the average cost for all species. These southern yellow pines find a great variety of uses in the car trade. Especially they are used for heavy framing and construction, siding, flooring, roofing, decking, and grain doors. The oaks are used largely for car frames, posts, and locomotive woodwork. White oak is very



CAR CONSTRUCTION

Frame of a street car in course of construction. Wood is still largely used for frames and flooring, notwithstanding the inroads made by steel construction.

important in high-grade repair work where great strength is required. Some specifications demand oak only for the framework of pilots and for passenger-car draft-timbers and sills, while either oak or ash must be used for car trucks. Oak is demanded generally for end sills of tenders and bumper beams of locomotives, car bearers, bolsters, posts, and braces. Spruce is mainly used for running boards. White pine, in addition to general construction uses such as siding and framing, is used for tool boxes, core boxes, and trim. Yellow poplar, one of the higher-priced woods, is used along with mahogany, maple, and the oaks for passenger car finish. The higher-grade quarter-sawed oaks, showing such beautiful grain in interior finish, come from the central western States. Hard maple is used in considerable quantities for car platforms. Douglas fir, like yellow pine, is used for sills and beams where strength is required. Mahogany, supplemented by imitations from birch and other woods, is the principal finish of passenger cars.

The average cost of all woods, $59.32, is lower than in most industries. Among the reasons why the cost of car stock is comparatively low, notwithstanding the fact that a good grade of material is demanded, are that the stock for car repairing need not be dressed and that the railroads can haul stock from distant States without paying heavy charges for transportation.

The form of the raw material is generally rough planks, but much of it is dimension stock for posts, sills, etc. The lengths, widths, and thicknesses of the rough planks are generally cut to order. The standard lengths for car and dimension oak are 8, 9, 10, 12, 14, and 16 feet. Dimension-sawed common oak plank and timbers used for car building purposes must be free from wind shakes, dry rot, rotten knots, or defects which impair the strength of the piece.

While New York contributes but 1,335,000 feet of the raw material, there is a great possibility of developing a splendid market at home. Railroad companies prefer to buy local stock whenever it is available and New York woodlot owners should endeavor to ascertain the form, grade, and species desired by purchasing agents in their vicinity. Only a few of the 18 species needed by the railroads are necessarily purchased

abroad and in very small amounts for interior finish. The total expenditure of over $2,000,000 annually by the railroad companies for woods should attract the attention of our local lumbermen and bring about a greater consumption of home-grown mature timber especially along the railroads. The species in order of importance contributed by New York are white oak, birch, hard maple, and red oak; other species contributing but small quantities are yellow poplar, beech, chestnut, basswood, and hemlock.

TABLE 9

CAR CONSTRUCTION

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	34,476,000	100.00	$59 32	$2,045,035	1,335,000	33,141,000
Southern yellow pine	22,652,000	65.71	$63 86	$1,440,557	.....	22,652,000
White oak	6,564,000	19.03	52 86	346,983	380,000	6,184,000
White pine	1,166,000	3.38	55 83	65,098	.....	1,166,000
Hard maple	545,000	1.58	30 41	16,573	270,000	275,000
Yellow poplar	531,000	1.54	101 59	53,944	10,000	521,000
Birch	530,000	1.53	34 17	18,100	288,000	242,000
Red oak	500,000	1.46	40 00	20,000	250,000	250,000
Beech	470,000	1.36	30 08	14,138	50,000	420,000
Chestnut	452,000	1.31	31 09	14,053	50,000	402,000
Basswood	352,000	1.03	30 75	10,824	25,000	327,000
Ash	220,000	.64	59 38	13,064	.....	220,000
Spruce	213,000	.62	41 01	8,735	.....	213,000
Douglas fir	128,000	.37	32 00	4,096	.....	128,000
Western white pine	50,000	.15	135 00	6,750	.....	50,000
Mahogany	28,000	.08	215 00	6,020	.....	28,000
Red pine	25,000	.07	120 00	3,000	.....	25,000
Hemlock	25,000	.07	34 00	850	12,000	13,000
Cypress	25,000	.07	90 00	2,250	.....	25,000

The total quantity of lumber reported by the car trade is but one-half the amount in 1912. This decrease is due to a smaller number of establishments in the State, to the excessive cost of labor and materials, and to the displacement of wood by metal. It is a fact that steel has forged ahead tremendously as a car-building material within the past ten years. "The Railroad Tie Producer" for March, 1920, quotes an authority as saying that, because of a lack of 500,000 freight cars, it will take the car manufacturing plants at full time three years to

catch up with the demand for new cars. This statement indicates that in the near future the car industries will be calling for a greater quantity of wood than was used in 1919.

Shade and Map Rollers

Table 10 refers to curtain poles, rug poles, map rollers, and shade rollers, the consumption of such articles being 29,946,000 feet annually. The manufacture of shade rollers is a special line, and several firms are engaged exclusively in the production of this article. A large part of the white pine reported is used by such establishments. Some plants are equipped only to manufacture shade roller blanks bored and fitted to receive the spring. The dimensions of shade rollers used in large quantities are 15/16 of an inch in diameter and 36¼ to 42 inches in length, bored in one end to a depth of 9 inches to receive the spring and chamfered on the same end to receive the ferrule. The raw material is largely shipped in from Canada and is well-seasoned and kiln-dried white pine. Some of the rollers are made of two pieces and joined together with a plug splice which is, of course, glued. Local manufacturers have for years reported a scarcity of suitable clear stock. There is no reason why the clear, soft, light, white, nonresinous, workable white pine of New York's forests should not supply all their needs, if it were always available in sufficient quantities.

TABLE 10

Shade and Map Rollers

Kind of Wood	Quantity Used Annually		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Tota	29,946,000	100.00	$44 23	$1,324,434	2,523,000	27,423,000
White pine.....	26,226,000	87.57	$44 40	$1,164,434	1,923,000	24,303,000
Basswood.....	1,100,000	3.67	42 00	46,200	100,000	1,000,000
Red pine.....	1,000,000	3.34	42 00	42,000	.....	1,000,000
Spruce.....	1,000,000	3.34	42 00	42,000	.....	1,000,000
Hard maple.....	250,000	.84	45 00	11,250	250,000	.....
Beech.....	250,000	.84	45 00	11,250	250,000	.....
Red gum.....	100,000	.34	55 00	5,500	.....	100,000
Ash.....	20,000	.06	90 00	1,800	.....	20,000

The hardwoods contribute the raw material for the curtain poles and trimming. Red gum is used exclusively for curtain poles, while basswood is used only for rug poles. Beech, ash, and sugar maple contribute to the production of both curtain and rug poles, but the principal raw material used for rug poles is beech. In 8 years this industry has undergone a tremendous expansion, as twenty times as much is now consumed in a single year as was reported in 1912.

Caskets and Coffins

Twenty-two woods are consumed locally for the production of caskets and coffins, and 29,230,000 feet of raw material brought an average price of $65 per thousand during the high-market period of 1919. The industry includes not only caskets but also the rough outer boxes, which explains the use of a large quantity of very ordinary wood. The more expensive veneers, such as mahogany, are imported from the tropics for the outside finish of the highest-grade caskets.

Two styles of caskets are made, usually the finest class being finished in natural wood, while the others are covered with dark woolen cloth. Since the cloth-covered caskets are in more general use, the woods which are suitable for this purpose include chestnut and white pine, the principal species contributing to the industry. Chestnut has the capacity to resist decay and contributes more than 50 per cent of the raw material for the whole industry. Some of the larger factories depend almost entirely upon chestnut and white pine. Because chestnut resists decay and because minor defects, such as worm holes, do not interfere with usefulness in this industry, its utilization in the form of very low-grade stock is possible. The standard grade known as "sound wormy" is consumed in very large quantities and at prices well below the average for the industry Well selected high-grade chestnut stock is sometimes used as outside material, but generally it is used as a backing with a veneer of the more expensive woods or as the body of the cloth-covered coffins. Mahogany and yellow poplar, white and red oak, and birch are all popular woods for the outside finish.

CASKETS AND COFFINS

The assembling room of a casket factory. An eminent authority remarks that human beings are surrounded, from the cradle to the grave, by essential articles made of wood.

TABLE 11

CASKETS AND COFFINS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	29,230,000	100.00	$65 41	$1,911,838	360,000	28,870,000
Chestnut	15,689,000	53.67	$56 40	$874,860	150,000	15,539,000
White pine	5,983,000	20.47	62 72	376,254	.....	5,983,000
Red oak	1,704,000	5.83	106 74	183,485	.....	1,704,000
Western white pine	1,677,000	5.74	52 10	87,372	.....	1,677,000
White oak	1,340,000	4.58	90 73	121,578	.....	1,340,000
Cypress	978,000	3.35	71 68	70,103	.....	978,000
Mahogany	656,000	2.24	174 68	114,590	.....	656,000
Yellow poplar	298,000	1.02	69 54	20,723	.....	298,000
Redwood	247,000	.85	64 93	16,038	.....	247,000
Spruce	125,000	.43	48 00	6,000	.....	125,000
Birch	115,000	.39	70 00	8,050	95,000	20,000
Basswood	100,000	.34	73 00	7,300	100,000	.....
Black walnut	53,000	.19	119 62	6,340	.....	53,000
Douglas fir	50,000	.17	70 00	3,500	.....	50,000
Southern yellow pine	50,000	.17	59 00	2,950	.....	50,000
Buckeye	44,000	.15	67 50	2,970	.....	44,000
Tupelo	30,000	.10	60 00	1,800	.....	30,000
Southern red cedar	26,000	.09	135 00	3,510	.....	26,000
Ash	25,000	.08	65 00	1,625	.....	25,000
Hard maple	20,000	.07	72 00	1,440	.....	20,000
Beech	15,000	.05	60 00	900	15,000	.....
Red gum	5,000	.02	90 00	450	.....	5,000

For the outer boxes and shipping cases white pine, yellow pine, and yellow poplar are generally used. Cypress is also used on account of its resistance to decay in contact with the soil, and throughout the United States it is one of the principal casket woods. Red cedar, like cypress, is one of the most enduring woods. It has the further recommendations of holding its form well, taking a pleasing finish, and having an agreeable odor. The comparatively small amount used at this time is evidence of the scarcity of the wood, as it formerly was extensively employed everywhere for the burial of the dead. Two million feet of California redwood finds its way across the continent for use in this industry on account of its ability to resist decay in contact with the soil, and it is supplied at a

price below the average. Black walnut is, on account of its workable qualities, a desirable material but too scarce and expensive to be utilized to a large extent. With the exception of southern red cedar, it is the most expensive native wood used in the industry. There is much chestnut in the woodlots of New York that might be utilized in the casket and coffin industry were it not for the fact that the large corporations in the business generally prefer to obtain their stock from wholesalers located in the larger timber areas of West Virginia, Kentucky, and North Carolina. Chestnut which has suffered chestnut blight makes very satisfactory material.

Large factories are located in New York, Brooklyn, Buffalo, Rochester, Elmira, Oneida, Syracuse, Webster, and other points throughout the State.

Chairs

Table 12 accounts for 22,300,000 feet of raw material consumed. This industry is really a part of the furniture manufacture; but certain manufactories make a specialty of chairs, and it is possible to fairly well distinguish these plants from the general furniture establishments. Hardwoods contribute almost all of the woods going into chairs. The seats and backs are generally of veneer and manufactured as a separate commodity by some factories. Usually three sheets of thin veneer are glued together, and the articles are generally perforated. Such built-up stock for three-ply seats and backs, having the grain of the middle sheet at right angles to those on the outside is much stronger than a solid wood construction of the same thickness.

New York turns out all kinds of chairs, from the cheapest camp chairs to the finest office and lodge furniture. Mahogany and black walnut are the most expensive woods employed, and beech is the cheapest. The rather low price, as reported in this table, is due to the fact that one of the largest firms using several million feet of Adirondack hardwoods, owns its stumpage. This is an example for the trade. There is no

insurance against a wave of high prices that can compare with the ownership of forest land. To some extent the employment of standard dimension stock also helps to keep moderate the price of this class of lumber. Other classes of furniture change so rapidly in styles and forms, as fashion may dictate, that it is difficult to conduct a furniture factory on an economical basis of production. The chair industry is not wasteful, the plants being able to utilize very small pieces. This is an industry in which home-grown material predominates on account of the relatively large amounts of birch, maple, and beech employed. Nearly 60 per cent of the chair stock reported was grown in New York State.

The chair industry has within the past 10 years become highly specialized. There are three distinct divisions: First, the manufacture of chairs of the cheapest variety, such as kitchen chairs, dining-room chairs, nursery chairs, and living-room chairs made to meet the demand for the lowest priced article that can be produced; second, the manufacture of a medium grade of chairs for living room, library, and parlor use which are known to the trade as "fancy chairs"; third, the manufacture of chairs which are partly or entirely covered with upholstery, which are known to the trade as "upholstered chairs." The latter division, however, can not be clearly defined because all three classes use more or less upholstering in their product. The first class employs beech, gum, and maple to a large extent. The second class uses principally birch, gum, and mahogany. The third class employs birch and mahogany for the exposed parts of the frame, while those parts which are upholstered are made largely of sound wormy chestnut and of elm, beech, and maple. The use of built-up veneered seats and backs is largely confined to the first or cheapest class and to the manufacture of store and railroad station furniture, such as settees. Chairs designed for the furnishing of school rooms are of special models suitable for the purpose and are made largely of oak, but to some extent employ the veneered seat.

TABLE 12

CHAIRS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	22,318,000	100.00	$58 35	$1,302,410	13,073,000	9,245,000
Birch	4,938,000	22.13	$48 05	$237,271	2,349,000	2,589,000
Hard maple	4,270,000	19.13	45 49	194,192	4,055,000	215,000
Beech	3,270,000	14.65	34 71	113,502	3,270,000	.....
White oak	3,212,000	14.38	93 10	299,037	250,000	2,962,000
Elm	1,686,000	7.55	39 25	66,175	930,000	756,000
Basswood	1,128,000	5.06	39 82	44,917	1,086,000	42,000
Red gum	1,070,000	4.80	79 23	84,776	.....	1,070,000
Mahogany	795,000	3.56	191 32	152,099	.....	795,000
Cherry (black)	783,000	3.51	39 79	31,156	760,000	23,000
Ash	610,000	2.73	48 68	29,695	348,000	262,000
Red oak	276,000	1.24	77 63	21,426	.....	276,000
Black walnut	185,000	.83	129 65	23,985	.....	185,000
Buckeye	38,000	.17	45 00	1,710	.....	38,000
Spruce	30,000	.14	40 00	1,200	.....	30,000
Chestnut	27,000	.12	47 00	1,269	25,000	2,000

MOTOR VEHICLES

The phenomenal increase in the use of motor-driven vehicles has so outstripped the manufacture of horse-drawn vehicles that the wood consumption of each line of industry is tabulated separately for the first time in this study. Trade statistics show that in New York the ratio of motor vehicles to population is now 1 to 19.12, while in the United States the ratio is 1 to 14.14. Canada comes next in order with a ratio of 1 to 21.

In 1919 the manufacturers of automobiles, trucks, auto bodies, truck bodies and wheels, together with the repairers of motor-driven vehicles report the consumption of 20,813,000 feet of wood. The high grades necessary for this exacting service are indicated by the very high average price of $101.08 per thousand paid for the raw material.

White ash with a consumption of over 7,000,000 feet or 35 per cent of the total is the wood in greatest demand. Northern grown ash has qualities of toughness and resiliency which

render it matchless for the purpose. It is the king of woods for the motor industry, being used for more purposes as well as in greater quantity than any other. Several manufacturers note their appreciation of this wood and regret that a larger supply is not available having the qualities of that grown in New York. It appears in the bentwood bows for tops, seats, bodies, wheels, and even in the chassis of certain well known cars. Maple and oak go into bodies of both pleasure cars and trucks, with paneling of ash, oak, maple, elm, and poplar. Seats are of yellow poplar, oak, and ash. Bodies of heavy trucks have frames of oak, maple, and yellow pine, with flooring and steering-wheel rims of maple. Hickory, ash, and oak are the main components of motor wheels, and here again the makers call for a larger supply of New York-grown hickory, as well as basswood for panels. In the bodies of light trucks and in repairs, the other species mentioned are all utilized, except mahogany which is reserved for trimmings of the finest touring cars. Rosewood, though not tabulated, is also used for this purpose.

Recently the Forest Service canvassed all the automobile manufacturers of the United States, asking what woods were best adapted to the different parts of the wooden construction. The following table is a condensation of the major part of the replies received. The figures opposite each species indicate the number of makers who choose that wood for the purpose at the top of the column.

Woods Chosen by Manufacturers of Automobiles and the Purposes to which They Are Adapted

	Spokes	Rims	Body Parts		Door frames	Floor boards	Seat boxes	Running boards	Top bows
			Straight	Bent					
Ash	3	7	41	28	36	26	11	16	33
Oak	....	7	23	10	10	27	14	13	26
Elm	....	4	15	23	15	.....	9	1	6
Maple	....	....	22	....	18	15	5	4	.....
Gum	....	....	6	2	2	5	6	2	1
Yellow poplar	....	....	9	1	2	7	19	.....	.....
Hickory	55	43	.....	1	.....	.....	.....	.....	5

The heavy majority in favor of hickory for spokes should be noted. The failing supply of this wood has resulted in the application of much inventive genius to the evolution of wheels which could dispense with hickory. Wheels made of steel disks are seen not infrequently, and other plans are being tried, notably along the line of laminated wooden construction.

The repair of motor cars and trucks and the building of delivery bodies adapted to transform old automobiles into light trucks constitute an enormous business, which occupies many of the shops and the men who were formerly in the wagon-building and repair trade. The 566,511 motor vehicles reported in New York State will continue to require great amounts yearly of ash, oak, hickory, maple, elm, and basswood. The racking strains of motor service demand the finest quality of wood to be had, both for repairs and in new cars and trucks.

Out of the 19 species tabulated 14 can nowhere else be grown to better advantage for quality than in New York. Yet the

TABLE 13

MOTOR VEHICLES

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	20,813,000	100.00	$101 08	$2,103,699	5,592,000	15,221,000
Ash	7,322,000	35.18	$140 77	$1,030,718	2,329,000	4,993,000
Hard maple	3,126,000	15.02	87 99	275,057	789,000	2,337,000
White oak	2,905,000	13.96	105 63	225,855	681,000	2,224,000
Yellow poplar	1,319,000	6.34	116 48	153,637	12,000	1,307,000
Southern yellow pine	1,204,000	5.78	71 44	86,014	.....	1,204,000
Birch	1,151,000	5.53	60 95	70,153	1,000,000	151,000
Basswood	860,000	4.13	66 72	57,379	313,000	547,000
Hickory	831,000	3.99	100.14	83,216	165,000	666,000
Spruce	536,000	2.58	83 04	44,509	4,000	532,000
Red gum	424,000	2.04	38 81	16,455	.....	424,000
Beech	400,000	1.92	40 00	16,000	160,000	240,000
Loblolly pine	314,000	1.51	38 61	12,124	.....	314,000
Elm	143,000	.69	65 11	9,311	37,000	106,000
White pine	105,000	.50	90 00	9,450	.....	105,000
Red oak	100,000	.48	60 00	6,000	100,000	.....
Cypress	38,000	.18	99 82	3,793	.....	38,000
Cottonwood	25,000	.12	60 00	1,500	.....	25,000
Mahogany	8,000	.04	300 00	2,400	.....	8,000
Chestnut	2,000	.01	64 00	128	2,000	.....

State produced only one-fourth of the total amount consumed This would seem the finest opportunity possible for the owners of New York woodlots to keep within the State nearly $1,500,000 which was paid out to other States for wood used in motor vehicles.

Agricultural Implements

New York is prominent in the manufacture of agricultural implements. The factories cover a broad field of activity, producing general agricultural implements, such as threshers, binders, corn cutters, cultivators, drills, ensilage cutters, grain cradles, harrows, harvesters, hay loaders, hay racks, hay tedders, hay presses, hoppers, lawn mowers, planters, plows, spreaders, windmills, etc. This industry is closely related with handles and vehicles in that most of the material going into the agricultural-implement stock consists of vehicle poles, singletrees, whiffletrees, or handles for articles such as plows, cultivators, and drills, while only the conveying or vehicle parts consist of wood. The manufacture of agricultural implements in the State is extremely important, the amount of wood consumed being only a small proportion of the raw material used in the production of the finished article. The total consumption amounts to 19,000,000 feet annually and the average price paid by the manufacturers $62.83 per thousand feet in 1919. About one-third of the raw material is home-grown and the various establishments are so generally distributed over the State that woodlot owners are in a position to supply the needs of factories at their doors without heavy transportation charges.

The southern pines have superseded maple in first place since 1912, relative to quantity consumed. Longleaf pine is imported in large quantities for use as implement poles, where its strength makes it a desirable material.

Sugar maple is consumed in larger quantities than any other wood except yellow pine, and is used largely for singletrees, neck yokes, eveners, drill frames, lawn mower handles, drill boxes, and seed boxes of general agricultural implements. Its hardness recommends it also for ensilage cutter frames and

cutter blocks. Two-thirds of the sugar maple used in the industry is home-grown.

White oak is needed for the framework of articles such as hay presses and hay racks, and as beams for handles. Ash takes its place in the handle parts of cultivators and along with oak in plow beams, plow handles, and tanks of the heavier farm machinery. Many of the woods, such as spruce, basswood, beech, white pine, hemlock, and yellow poplar, have no special qualifications for a particular use in the industry but are used indiscriminately for all kinds of framework.

Red gum is imported in large quantities and finds use mainly as box material in threshing machines and other smaller articles.

Hickory is used for maul and hay fork handles and for repair work of vehicles, especially the replacing of spokes. A small amount is used for rods connected with threshing

TABLE 14

AGRICULTURAL IMPLEMENTS

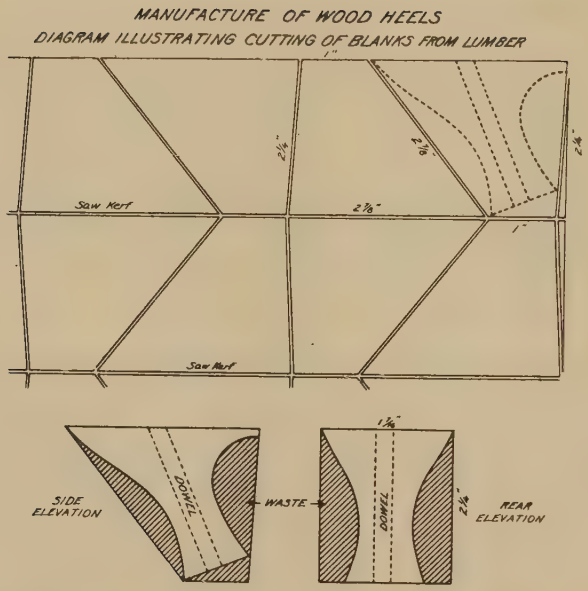
KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	19,064,000	100.00	$62 83	$1,197,890	6,551,000	12,513,000
Southern yellow pine	4,117,000	21.60	$80 97	$333,353	.....	4,117,000
Hard maple	3,495,000	18.33	63 06	220,395	2,390,000	1,105,000
Spruce	2,620,000	13.74	38 00	99,560	20,000	2,600,000
Birch	1,427,000	7.49	55 17	78,728	1,290,000	137,000
White oak	1,308,000	6.86	71 71	93,797	866,000	442,000
Basswood	1,271,000	6.67	71 52	90,900	178,000	1,093,000
White pine	1,265,000	6.64	43 82	55,432	352,000	913,000
Beech	1,238,000	6.49	45 06	55,784	1,127,000	111,000
Ash	348,000	1.83	74 42	25,898	188,000	160,000
Elm	340,000	1.78	66 04	22,454	75,000	265,000
Yellow poplar	319,000	1.67	76 51	24,407	.....	319,000
Western white pine	300,000	1.57	70 00	21,000	.....	300,000
Cottonwood	270,000	1.42	70 55	19,049	.....	270,000
Hemlock	165,000	.87	40 00	6,600	65,000	100,000
Red gum	165,000	.87	79 70	13,151	.....	165,000
Hickory	125,000	.66	87 00	10,875	.....	125,000
Cypress	116,000	.60	71 40	8,282	.....	116,000
Loblolly pine	100,000	.52	130 00	13,000	.....	100,000
Douglas fir	50,000	.26	82 00	4,100	.....	50,000
Chestnut	25,000	.13	45 00	1,125	.....	25,000

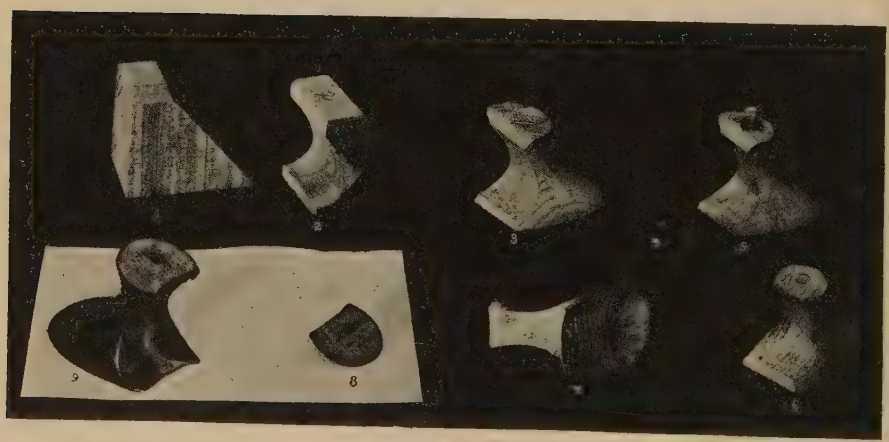
machines, where extreme toughness and capacity to resist shock are essential properties. A small amount of bald cypress is imported into the State and is used principally for tanks in the threshing line. Elm is used chiefly for hay racks and ensilage cutter frames. Hickory is the highest-priced wood consumed in the industry, the entirely disproportionate price tabulated for loblolly pine being caused by a freak of the market at a time when astonishing prices were paid occasionally for material to keep factories up to the demand.

Boot and Shoe Findings

Boot and shoe findings include principally lasts, last blocks, shoe forms, shoe trees, fillers, and pegs. Sugar maple is the principal last stock for all factories and contributes 90 per cent of the wood used. The list of last woods includes persimmon and beech, but these woods are not important in the industry. Basswood is used occasionally for lasts, generally as a filler, in the blocks, and for hollow forms. Sugar maple so admirably meets the requirements of the last industry that comparatively little other wood is used. All the woods used are home-grown except persimmon, which is brought from Arkansas, Tennessee, and other States. The short haul and the use of bolts or logs at the factory instead of rough-turned last blocks are factors of great aid in keeping down the cost of the high-grade wood demanded. Maple is preferred because it is hard, smooth-grained, tough, capable of high polish, does not warp or shrink, holds metal clamps well, and resists the severe wear to which it is subjected. The fact that New York's woodlots and forests contribute 84 per cent of the maple consumed in the manufacture of lasts is evidence of the natural economic location of these factories. The industry is growing and will need all the bolts and rough dimension blocks available from our local woods.

One of the features of remark in this industry is the increase of factories making wooden heels for women's shoes, of which there are about 15 in New York and Brooklyn. This branch of the industry demands large quantities of high-grade hard





BOOT AND SHOE FINDINGS

Successive steps in manufacture of a wood heel.

maple which is cut into small blocks before being fed to turning machinery. The waste in turning amounts to 70 per cent or more on account of the deeply curved surfaces. This is apparently a line of work which might use to advantage clear maple blocks, the by-product from other industries.

As seen in one factory the procedure is as follows: The raw material consists of rough hard maple, No. 1 Common, 12 inches wide and 1-7/16 inches in thickness. The planks are sawed lengthwise into strips 2¼ inches wide, and these strips are then cut off into blocks of dimensions which will just enclose the largest size of heel. The diagram above illustrates the plan on which the sawing is done, while figure 1 in the illustration shows the block immediately after it has been sawed. These blocks are taken one at a time by workmen and fed into a machine which quickly cuts out the curved surface of the front face of the heel, as shown in figure 2. The block is then fed to a second machine in which it passes before curved revolving knives. These produce the graceful curved surfaces of the rear side of the heel, leaving it with the usual narrow neck. This neck is a weak spot, and although care is taken to have the grain of the wood follow the most advantageous planes, there would not be sufficient strength to withstand the strains to which a heel is subjected if it were not for the additional stiffness rendered by the dowel shown in figure 4. A hole is bored vertically through the heel, and the dowel dipped in glue and driven into the hole as shown in figure 5. Following this process the bearing surface of the heel is sawed off, dowel and all, at the proper plane to meet the ground squarely in the act of walking, as illustrated in figure 6. In this stage the upper surface of the heel is flat, which would be uncomfortable to the foot of the wearer. Therefore it is passed through another machine which produces a suitable hollow to receive the heel of the wearer as shown in figure 7. Figure 8 shows the small piece of sole leather which is used as a cap to receive the wear of the pavement and also aid in preventing splitting in the vertical plane. This is put in place and fastened securely with a screw and several nails. In

figure 9 we see the finished heel, which has been covered with an enameled metal jacket, or else with leather, as in the case of white kid heels. The heels are then assorted for size, wrapped in tissue paper, and packed in paper boxes for sale to users of boot and shoe findings.

The statement is made by manufacturers that approximately 60 per cent of the wood purchased goes into waste, but as far as might be judged by noting the reduction in weight from a block to a finished heel, 78 per cent of the block goes into chips, in addition to the considerable loss resulting from the numerous saw kerfs when the plank is cut into blocks. In the diagram, figure 2 is a side elevation of one of the blocks, the shaded portion indicating the part which is cut away by the machines and goes into waste. Figure 3 is a rear elevation of the same block indicating the waste in that plane. It would seem probable that only about one-fourth of the lumber purchased for this industry ever becomes part of the finished product. The rest is chips and sawdust.

TABLE 15

BOOT AND SHOE FINDINGS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	14,705,000	100.00	$65 44	$962,280	12,465,000	2,240,000
Hard maple	13,090,000	89.01	$66 15	$865,903	10,960,000	2,130,000
Basswood	1,055,000	7.17	56 22	59,312	1,050,000	5,000
Beech	385,000	2.61	52 00	20,020	385,000	.....
Persimmon	105,000	.72	123 71	12,990	.....	105,000
Birch	40,000	.27	73 00	2,920	40,000	.....
Elm	25,000	.18	35 00	875	25,000	.....
Hickory	5,000	.04	52 00	260	5,000	.....

In view of the large percentage of waste, this industry would seem to be one in which the waste hardwood blocks from other industries might be utilized to advantage, because the increasing price of material might now warrant the sorting, shipping, and resawing.

Matches

Wood for the production of matches and match splints must be easily worked and capable of producing a moderate flame and must also have the capacity of holding the dipping material well. Many types of machinery are used for match making. To produce the matches, the boxes into which they are packed and the labeling of boxes requires a very ingenious mechanism. There must be machines for cutting the lumber into strips and small blocks, for dipping the sticks, drying the matches, and packing and labeling the boxes. Some inventors have devoted the whole of their lives to the perfection of apparatus for the manufacture of matches. It is reported that the machine for filling the boxes with sticks alone took ten years' time of one skilled inventor.

The United States is the only country in the world which makes and uses a round match. For this purpose white pine is used in great quantities by large match factories in the northern portion of the State. This industry calls for 2-inch boards or deals of clear stock free from all defects, and it is largely shipped from Canada, the Lake States, and the far West. The soft wood of clear white pine is necessary for this process because the machines in common practice punch the sticks from blocks of the proper length.

The square matches of the "safety" type, which are commonly used throughout foreign countries, and to an increasing extent in the United States, are made by turning logs into veneer and then chopping the veneer into suitable sizes for the splints. Basswood and aspen are the species mainly employed, derived from Canada, New York, and Vermont. No aspen was reported in 1919.

The subsequent process of placing the chemical tip on the splints is carried on in specialized factories, which also make up the boxes from veneer and paper. The United States produces its own square matches to some extent but imports over 5,000,000 gross of boxes annually from Scandinavia, Japan, and other foreign countries, where very many styles of matches

and match-box attachments are produced. New York, however, uses many millions of feet of lumber in her own factories for the production of matches and vies with other States for first place in the industry. Square match splints are exported to England, France, Mexico, Venezuela, and other South American countries. The use of spruce in the industry is accounted for by the consumption of veneer in the manufacture of the match boxes. The average price of $52.32 per M. quoted in the table is very moderate, as it is known that white pine of high grade cost up to $200 per M. at the period of this report and shortly thereafter, while the other species, in the log, went as high as $80. The most remarkable aspect of the situation in this industry is that New York State should be compelled to import all of the white pine and spruce used. Is it not an absurd situation, for a state which once stood foremost in production of these species?

TABLE 16

MATCHES

Kind of Wood	Quantity Used Annually		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	14,250,000	100.00	$52 32	$745,500	300,000	13,950,000
White pine	10,000,000	70.18	$52 50	$525,000	.....	10,000,000
Western white pine	2,000,000	14.03	52 50	105,000	.....	2,000,000
Spruce	1,500,000	10.53	50 00	75,000	.....	1,500,000
Basswood	750,000	5.26	54 00	40,500	300,000	450,000

Woodenware and Novelties

Probably no industry in the whole report contains so many separate, distinct articles of commerce as are tabulated under the above heading of Woodenware and Novelties. The ordinary household articles known as "woodenware" and the more ornamental article known as a "novelty" are not so much confused in their makeup and uses as in their production. Establishments that make one are so frequently manufacturers

of both classes of material, consuming similar stock and reporting their consumption of raw material together, that it is not an easy matter to compile the data separately. The best way to outline the scope of this classification is to enumerate many of the articles included in the total of 13,000,000 feet reported in Table 17. The principal wood-consuming products are: Bread boards, buckets, butter dishes, butter moulds, cloth boards, coat hangers, clubs for policemen, cutting boards, scoops, doilies, ladles, door knobs, drain boards, gavels, reels, rolling pins, snow shovels, tent stakes, tent toggles, small tubs, and sugar tubs and boxes. Thus the industry includes all kinds of serving utensils and other culinary articles of the smaller size, together with semi-useful and more ornamental articles such as wooden candle sticks, paper weights, carvings, jewel boxes, etc. Much of the material going into these articles, especially such as dishes, is made of rotary-cut veneer, produced directly from the log, and is very cheap since the finished articles are intended to be used only once and then thrown away. Among such articles are dishes used by grocerymen for the handling of butter and lard. The hardwoods that are cheap, easily veneered, free from odor and stain, are in general demand, the principal contributing species being basswood, beech, and sugar maple. In some novelty lines the softwoods are very important, most of the southern yellow pine and white pine reported going into such articles as small flag poles. The hardwoods, particularly ash and maple, are turned into rustic novelties. The major portion of the consumption of birch, sassafras, and black walnut goes for the production of rustic and other novelties. Ladders are manufactured by many firms, and the principal contributing species are ash, maple, and oak. Most of the ash and maple is used for ladder rungs. The foreign woods are used for carvings of the more ornamental kind and for gavels, police clubs, etc. New York manufacturers expend annually over $250,000 for the raw material going into these small wares and most of this money goes into the purses of the woodlot owners of the State.

TABLE 17

WOODENWARE AND NOVELTIES

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	13,745,000	100.00	$39 94	$548,981	9,270,000	4,475,000
Hard maple	4,404,000	32.04	$31 23	$137,537	3,705,000	699,000
Beech	2,649,000	19.27	27 42	72,636	2,568,000	81,000
Birch	2,340,000	17.02	28 70	67,158	2,226,000	114,000
Spruce	1,798,000	13.08	33 42	60,089	75,000	1,723,000
Basswood	746,000	5.43	59 32	44,254	347,000	399,000
White pine	435,000	3.16	69 16	30,085	150,000	285,000
Ash	235,000	1.71	48 65	11,433	106,000	129,000
Yellow poplar	190,000	1.38	66 93	12,717	.....	190,000
Loblolly pine	176,000	1.28	32 00	5,632	.....	176,000
Mahogany	131,000	.96	250 00	32,750	.....	131,000
Lignum-vitae	121,000	.88	300 00	36,300	.....	121,000
Southern yellow pine	100,000	.73	100 00	10,000	.....	100,000
Cypress	90,000	.65	50 00	4,500	.....	90,000
Buckeye	75,000	.55	71 50	5,363	.....	75,000
Douglas fir	70,000	.51	68 00	4,760	.....	70,000
Cherry (black)	56,000	.41	38 13	2,135	56,000	.....
White oak	44,000	.32	117 14	5,154	.....	44,000
Elm	37,000	.27	25 81	955	37,000	.....
Chestnut	25,000	.18	50 00	1,250	.....	25,000
Black walnut	21,000	.15	200 00	4,200	.....	21,000
Sassafras	1,000	.01	21 00	21	.....	1,000
Arborvitae	1,000	.01	52 00	52	.....	1,000

HANDLES

New York, though not a leading State, is an important one in the production of handles. The Lake States and other central western States have the principal factories of the larger well known corporations manufacturing fork, hoe, and axe handles. Nearly every large manufacturing establishment has need for handle stock in one form or another. A number of industries like broom factories and cutlery stock occupy a prominent place. Establishments producing farm tools, files, saws, cutlery, and other metal implements call for a great variety of woods.

Maple and beech lead all species in the amount of wood consumed because the principal handle business from a standpoint

of quantity is that of brooms. Broom handles also consume a large amount of birch and white ash. Shovel handles are made largely of sugar maple, while snow shovels consume a great deal of white ash. Axe handles are made of hickory, brush handles of sugar maple, pick and peavy handles of white ash, hickory and yellow birch; while handsaws consume only applewood and beech. Fork and hoe handles are rarely ever made of any wood except white ash, of which a large amount is consumed for this purpose in other States, and most of the two million feet reported in New York goes into these articles. White ash is used for fork and hoe handles because it is tough, strong, and white. Hammer handles are made of hickory generally, this wood being almost indispensable for slender tool handles where strength and elasticity must be combined with toughness. Hickory is used in the rougher forms for mop handles, handrakes, sledge hammers and pick handles, along with white oak, white elm, and ash, where strength and resistance to sudden shock are essential requirements. Handles for coal sieves are made of basswood, beech, soft maple, and white ash. Many of the firms reported several woods under the general use of "handles" and the relative importance of each wood in the production of a given style of handle cannot be accurately determined. Broad conclusions are easily reached, however, relative to the specific uses of such woods as ash and hickory, the former being very generally used here for fork and hoe handles, while hickory is used universally for small tool handles and for axe handles. Saw handles also depend largely upon apple and beech, while the ordinary cutlery or knife handles consume all of the foreign woods such as cocobola, ebony, rosewood, granadilla, and lignum-vitae. Cocobola is rather oily and not subject to much swelling or shrinkage in water and when exposed to heat.

The form of the raw material going into handle factories is so varied, owing to the extremes in the dimensions of the finished articles, that detailed descriptions cannot be given. The class of handles, including the stock for hoes, forks, rakes, spades, and shovels, calls for squares of about 2 to 2½ inches

and the extreme length of 5 feet. One large plant producing fork, hoe, and rake handles uses clear white ash in the form of rough squares or strips 1⅝ by 1⅝ inches and 5 feet in length. Saw handles, on the other hand, are made from rectangular squares about 4½ inches wide, 1¼ inches thick, and only 12 inches long, while from this small block two saw handles are cut. Broom handles are usually made from 2-inch squares about 5 feet long. Axe handles call for an entirely different class of raw material, which is generally purchased by the cord and in the form of billets or bolts, either split or in round timbers, and cut 40 inches long. Small tool handles, cooking utensil holders, brush and pump handles, all call for different forms of raw material, according to their special needs.

TABLE 18

HANDLES

Kind of Wood	Quantity Used Annually		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	11,986,250	100.00	$37 95	$454,814	11,293,000	693,250
Hard maple	3,402,000	28.38	$31 98	$108,796	3,359,000	43,000
Beech	2,876,000	23.99	32 13	92,406	2,876,000	.....
Birch	2,616,000	21.83	30 58	79,997	2,616,000	.....
Ash	2,342,000	19.53	49 67	116,327	2,192,000	150,000
Hickory	468,000	3.90	58 57	27,411	16,000	452,000
Basswood	76,000	.63	27 68	2,104	76,000	.....
Applewood	33,000	.28	36 36	1,200	33,000	.....
Cherry (black)	27,000	.23	35 18	950	20,000	7,000
Yellow poplar	25,000	.21	17 00	425	25,000	.....
Spruce	23,000	.19	33 05	760	20,000	3,000
Cocobola	21,000	.18	525 00	11,025	.....	21,000
White birch	20,000	.17	20 00	400	20,000	.....
Hemlock	20,000	.17	23 00	460	20,000	.....
White oak	11,000	.09	100 00	1,100	10,000	1,000
Ebony	11,000	.09	900 00	9,900	.....	11,000
Elm	8,000	.07	20 00	160	8,000	.....
Black walnut	4,000	.03	92 50	368	2,000	2,000
Granadilla	1,000	.01	400 00	400	.....	1,000
Lignum-vitae	1,000	.01	300 00	300	.....	1,000
Cypress	1,000	.01	100 00	100	.....	1,000
Rosewood	250	*	900 00	225	.....	250

* Less than 1/100 of 1 per cent.

There is much waste in some branches of this industry, especially the manufacturing of handle stock from bolts. The public has always demanded an ivory-white axe handle to the exclusion of all heartwood. Specifications calling for all clear sapwood results in extreme waste. Exhaustive experiments conducted by the United States Forest Service have shown red hickory to be just as strong, weight for weight, as white hickory and highly suitable when of proper density for all types of hickory handles. Specifications that cover this point and also the inspection of hickory handles on the basis of rate of growth have been prepared by the Forest Service, and have been adopted by the War and Navy Departments, the Panama Canal Commission, and several of the leading railroads. On the other hand, some lumber mills in this State are manufacturing handles from stock which would otherwise go to the slab pile. The handle industry offers excellent opportunities for the utilization of small waste pieces.

Refrigerators and Kitchen Cabinets

This industry includes ice chests, kitchen cabinets, kitchen safes, dumb-waiters, kitchen counters, ice-cream freezers, and refrigerators. Seventeen species are reported and the consumption amounts to nearly 12,000,000 feet. Five species, chestnut, white oak, red oak, spruce and white pine, contribute over 80 per cent of the raw material.

Table 19 is designed to cover that class of articles used in the storage and preparation of foodstuffs for cooking, excepting the woodenware articles such as tables and spoons. Much of the wooden material used in refrigerators and kitchen cabinets and similar receptacles for food must be free from stain and odor. In addition to these qualities, especially for such uses as inside parts of refrigerators, woods must stand dampness and must scour well and give effective service where constant washing is necessary. Thus woods of quite different qualities are consumed in the production of these articles.

A large percentage of all the lumber used goes into refrigerators. Here, especially for outer parts, the combination

of strength and capability of taking a good finish is essential. The oaks are best suited with ash following closely. Outside finish also consumes a small amount of mahogany, maple, birch, and chestnut. Ash and elm are especially suited for slats in refrigerators, for ice counters or frames, where great strength, stiffness, and damp-resistance must be found in slender strips of wood. For inside partitions where the wood is hidden by metal linings, chestnut, spruce, and white pine are generally used. There has been recently a heavy increase in the amount of chestnut used for this purpose. Ordinary ice boxes for cellar use are sometimes made entirely of spruce. Ice-cream freezers are made of redwood, this species coming all the way from the Pacific Coast as the sole raw material going into this article. Ice-cream cabinets are made of the various pines. A large amount of white pine is used for refrigerator backs, and much of the yellow pine reported is also used for this purpose.

The second largest item in the table is that of kitchen cabinets, the rather modern carry-all or storage place for cooking utensils and dry foodstuffs. Generally speaking, the principal species used for this branch of the industry are white oak, red oak, yellow poplar, sugar maple, basswood, birch, red gum, and yellow pine. There is much confusion in the uses of the woods, but the particular uses of some can be pointed out. Red gum, for example, is very generally used for drawer bottoms. Maple, basswood, birch, and ash are generally used for inside construction, and the oaks for exterior finish. A large amount of yellow poplar is consumed for kitchen-cabinet tops.

Spruce is, next to ash, the most important home-grown wood in the industry, and the principal wood used for interior walls and partitions of refrigerators. It is the lowest priced wood in the list.

There is not much waste in this industry. Larger firms report the manufacture of brackets of various kinds from refrigerator dimension stock. Small blocks for brackets, carv-

ings, and turnery for decorative purposes make close utilization of the odds and ends of the valuable domestic and imported woods.

TABLE 19

REFRIGERATORS AND KITCHEN CABINETS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	11,562,000	100.00	$71 59	$827,767	145,000	11,417,000
Chestnut	2,665,000	23.04	$77 07	$205,392	.....	2,665,000
Red oak	2,000,000	17.29	87 00	174,000	.....	2,000,000
Spruce	1,912,000	16.54	41 40	79,157	30,000	1,882,000
White pine	1,545,000	13.38	56 81	87,771	.....	1,545,000
White oak	1,525,000	13.18	98 21	149,770	.....	1,525,000
Ash	1,085,000	9.38	80 50	87,342	115,000	970,000
Yellow poplar	397,000	3.43	47 20	18,738	.....	397,000
Western yellow pine	250,000	2.16	38 00	9,500	.....	250,000
Red gum	50,000	.43	102 00	5,100	.....	50,000
Hemlock	32,000	.28	48 00	1,536	.....	32,000
Hard maple	26,000	.23	35 05	911	.....	26,000
Cypress	15,000	.13	71 00	1,065	.....	15,000
Black walnut	15,000	.13	175 00	2,625	.....	15,000
Cherry (black)	15,000	.13	125 00	1,875	.....	15,000
Mahogany	10,000	.09	190 00	1,900	.....	10,000
Birch	10,000	.09	47 00	470	.....	10,000
Loblolly	10,000	.09	61 50	615	.....	10,000

FIXTURES

The manufacturers of fixtures consume 26 kinds of wood, using nearly 11,000,000 feet and paying for it the handsome average price of $85.44 per thousand feet f. o. b. factory. The industry is closely allied to those of furniture and interior house finish. The products referred to in Table 20 include articles that are at least temporarily fixed to the interior part of the house and not readily movable like furniture. Fixtures herein tabulated include equipments of banks, offices, stores, lodgerooms and churches and consist of altars, counters, drug cabinets, pews and pulpits, shelving, show cases, blackboards, billiard racks, wall cases, special telephone booths, window seats, specially made desks, tables and racks, glass-and-

sash partitions, and other articles made to order for a particular room and not to be used elsewhere. The fixtures occupy a middle place between furniture and interior finish. The latter, when put in place, is permanent and becomes part of the building; fixtures may be moved with more or less remodeling. Still another industry, "General Millwork" overlaps "Fixtures," because many woodworking establishments have included special orders for cheap fixtures in their reports of annual consumption for "General Millwork."

White oak leads all other species in quantity. Under ordinary market conditions oak is one of the most expensive woods, its cost being exceeded only by the cost of black walnut and imported woods such as mahogany, Circassian walnut, and rosewood. Yellow poplar occupies second place and its workableness and smooth, even grain and texture recommend it for backing, shelving, drawers, counters and interior parts of store fixtures. Chestnut is used along with many other cheaper woods for interior frames, shelving, and cores for veneer panels, forming the middle sheets upon which high-grade veneer woods are glued. It is also used for blackboards, mission fixtures, and telephone booths.

Fixtures consume many of the high-grade woods in the form of veneer, the broad panels of show cases and tops of many articles calling for veneers from white oak, red oak, black cherry, mahogany, red gum, black walnut, Circassian walnut, and rosewood for use as outside finish. Sugar maple is used in every way for the exterior parts of store and office fixtures, but by far the larger items are reported for the production of church and school furniture. Birch and cherry are used largely for cabinet work in connection with wall fixtures, but a considerable amount goes into solid parts in imitation of mahogany. Red gum occupies the same position, in imitation of Circassian walnut.

Much of the Circassian walnut used in New York comes from the shores of the Black Sea. Its high price of $800 per thousand feet limits its use to the very finest fixture, furniture, and cabinet work, and it was naturally difficult to obtain dur-

ing the war period. The wood weighs almost forty-five pounds per cubic foot, is hard, compact, easy to work and split, moderately tough, durable, shrinks little in seasoning, and does not warp or crack. Burled and other highly figured forms of the wood take a beautiful polish.

There are about seventy-five establishments in the State that specialize in the manufacture of fixtures and the industry is an important user of several home-grown species, including white oak, red oak, chestnut, birch, and white pine. Substitution has been general in the industry, the combination of metal strips and glass for show cases having become most extensive. The fixture industry used only half as much wood as in 1912,

TABLE 20

FIXTURES

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Fee t b. m.)
	Feet b. m.	Per cent				
Total	10,739,000	100.00	$85 44	$917,587	1,929,000	8,810,000
White oak	2,023,000	18.83	$135 47	$274,056	120,000	1,903,000
Yellow poplar	1,652,000	15.38	87 95	145,303	.....	1,652,000
Birch	1,585,000	14.82	70 68	102,028	432,000	1,153,000
Hard maple	1,125,000	10.48	27 39	30,814	532,000	593,000
Loblolly pine	880,000	8.19	50 49	44,431	.....	880,000
Chestnut	600,000	5.58	57 27	34,362	120,000	480,000
Red oak	500,000	4.65	65 00	32,500	500,000	.....
Spruce	498,000	4.64	48 10	23,954	75,000	423,000
Mahogany	462,000	4.30	233 63	107,937	.....	462,000
Douglas fir	310,000	2.89	51 84	16,070	.....	310,000
Basswood	210,000	1.96	50 83	10,674	40,000	170,000
White pine	183,000	1.70	87 99	16,102	42,000	141,000
Cypress	145,000	1.35	55 00	7,975	.....	145,000
Red gum	139,000	1.29	150 86	20,970	.....	139,000
Black walnut	123,000	1.15	209 09	25,718	.....	123,000
Cherry (black)	79,000	.74	22 50	1,778	.....	79,000
Soft maple	75,000	.69	52 00	3,900	25,000	50,000
Southern yellow pine	72,000	.67	197 22	14,200	.....	72,000
Ash	39,000	.36	32 82	1,280	35,000	4,000
Buckeye	20,000	.18	52 00	1,040	.....	20,000
Hemlock	8,000	.07	35 00	280	8,000	.....
Butternut	5,000	.04	75 00	375	.....	5,000
Southern red cedar	2,000	.02	110 00	220	.....	2,000
Witchhazel	2,000	.02	160 00	320	.....	2,000
Rosewood	1,000	*	500 00	500	.....	1,000
Circassian walnut	1,000	*	800 00	800	.....	1,000

* Less than 1/100 of one per cent.

but the cost of the material was nearly as great. No doubt the high cost of wood as well as the decrease in demand for barroom fixtures had a great deal to do with the apparent shrinkage of the industry.

Professional and Scientific Instruments

This industry consumes nearly 10,000,000 feet, at an average cost of $82.47 per thousand feet f. o. b. factory. Table 21 refers to such articles as are used by artists, engineers, mechanics, professional and scientific men, among them being photographic equipment, drawing boards, blackboards, erasers, geometrical blocks, gauges, calculating machines, mallets, map globes, mathematical instruments, mitre boxes, pencils, pencil boxes, palettes, penholders, pointers, leveling rods, rulers, measuring scales, recording instruments, spirit levels, T-squares, transit tripods, etc.

Southern red cedar contributes approximately one-fifth of the wood consumed by the industry and costs $150.00 per thousand feet. Red cedar is not suitable for most of the articles reported. Its use, however, is found in the production of lead pencils, and several establishments consume large quantities in the manufacture of this article. Southern red cedar (*Juniperus virginiana*) meets the requirements of the best lead pencils. Its commercial range extends from the Ohio River on the north as far east as eastern Tennessee and central Georgia, as far south as Tampa Bay on the west coast of Florida, and as far west as eastern Texas and central Arkansas. The requirements for lead-pencil material are very exacting — a soft wood, fine and straight-grained, free from defects, which will not warp or check. The heartwood of red cedar meets these requirements and has the additional special qualities of being light in weight, non-resinous, slightly aromatic, whittling well and having an agreeable taste. One of the earliest woods used for lead pencils abroad was red cedar grown in Virginia and Florida. After red cedar became the expensive pencil-wood, foreign manufacturers forfeited their position of importance to America.

The first successful plant in this country was started by Eberhard Faber in 1861 in New York City. His cedar-and-graphite pencil deposed the quill pen. The raw material for pencils is known as pencil slat and is 7¼″ x 2½″ x ¼. These slats are manufactured in the southern States and are shipped in bundles or crates to the manufacturers, a crate containing the raw material for 100 gross of pencils. The details of the manufacture of a pencil are simple but interesting. A slat is first run through a machine which makes six grooves in it. Six pieces of lead are then laid in the grooves and a coating of glue applied. Another slat is then laid over the top. The whole is then run through another machine which cuts out the material between the leads, producing a pencil in the rough state. The pencil is then polished, painted, stamped, and graded. Several large factories are located in the vicinity of New York City and Brooklyn. The scarcity of the raw material and the enormous consumption of wood have resulted in a very serious depletion of the supply. Nearly 16,000,000 feet of southern red cedar were used in 1912 as compared with the 2,000,000 feet reported in 1919. The result has been an eager search for all the remaining supply and the introduction of western red cedar (incense cedar — *Libocedrus decurrens*) in large quantities. Its cost was only one-third that of the southern species.

The next most important industry in the table is that of cameras. Rochester and Lestershire have camera works of international reputation, consuming for camera boxes and parts much gum, white pine, birch, cherry, beech, basswood, cypress, ash, mahogany, sugar maple, white oak, and yellow poplar.

Penholders are made almost exclusively from red gum; level blocks are made from cherry; thermometers from white oak; planes from beech; easels from beech and soft maple; surveyor stakes from oak, longleaf pine, chestnut and hickory; drafting tables and equipment from white ash, basswood, beech, mahogany, yellow birch and white pine. The best wood for surveyors' tripods and rods is hard maple.

Basswood is used for many of the articles enumerated, especially for yardsticks, rulers, drafting tables, and alphabet blocks. The manufacture of advertising novelties is very important in the largest cities and in several smaller places, including Bliss, Seneca Falls, Silver Springs, and Tonawanda, where the major portion of the basswood and sugar maple reported is turned into yardsticks and rulers as advertising novelties.

TABLE 21

PROFESSIONAL AND SCIENTIFIC INSTRUMENTS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	9,754,000	100.00	$82 47	$807,358	534,000	9,222,000
Southern red cedar	2,000,000	20.51	$150 00	$300,000	.....	2,000,000
Western red cedar	2,000,000	20.51	50 00	100,000	.....	2,000,000
Red gum	1,343,000	13.77	75 00	100,725	.....	1,343,000
Basswood	1,102,000	11.30	62 31	68,666	212,000	890,000
Beech	715,000	7.33	60 00	42,900	100,000	615,000
White oak	614,000	6.29	84 28	51,748	4,000	610,000
Sycamore	468,000	4.79	80 00	37,440	.....	468,000
Hard maple	447,000	4.58	66 55	29,748	11,000	436,000
Yellow poplar	400,000	4.10	72 00	28,800	.....	400,000
Birch	176,000	1.81	58 46	10,289	125,000	51,000
Cherry (black)	175,000	1.79	65 00	11,375	75,000	100,000
Tupelo	162,000	1.66	66 00	10,692	.....	162,000
Ash	62,000	.64	40 00	2,480	3,000	59,000
Hickory	30,000	.31	60 00	1,800	4,000	26,000
Mahogany	28,000	.29	235 90	6,605	.....	28,000
White pine	18,000	.18	145 00	2,610	.....	18,000
Cypress	10,000	.10	100 00	1,000	.....	10,000
Spruce	2,000	.02	55 00	110	.....	2,000
Butternut	1,000	.01	70 00	70	.....	1,000
Lignum-vitae	1,000	.01	300 00	300	.....	1,000

BASKETS AND FRUIT PACKAGES

The products referred to in Table 22 include crates for the shipment of bananas, celery, peaches, potatoes, small berry and lettuce boxes, hop-picking boxes, bushel crates, and the lighter class of fruit and vegetable packages. It was impossible to clearly separate in every instance these figures from the kindred

industry of "Dairymen's, Poulterers' and Apiarists' Supplies," nor from the larger industry of "Packing Boxes and Crates." Baskets is the only item easily distinguished. Much of the consumption of raw material was doubtless reported under the general description of packing boxes and crates. Berry boxes and small crates are generally thin veneer. Only the bottoms, tops, and corner parts of the heavier articles, such as potato and cabbage crates, are made of ordinary lumber, while even these pieces are generally ¼ to ½ of an inch thick, lightness being necessary to avoid excessive freight rates on cheap produce.

New York is normally foremost in the production of vegetables and apples. The total of 8,527,000 feet is probably far short of the actual amount consumed for the marketing of the State's horticultural and garden products. The stimulus to home gardening given by the war-garden movement, in a time when all produce was very dear, may have served to reduce materially the consumption for this industry.

Hardwoods predominate in the industry because strength and toughness are needed in the small dimension stock used. Hard maple, beech, and basswood are used for covers and bottoms of baskets. Hoops, handles and potato-crate slats are largely made of elm, basswood and beech, while the corner pieces, sills, and posts of crates are generally made from chestnut, elm, oak, and ash. The standard rims for baskets are frequently made of white or red oak, while the heart pieces of oak sometimes go into basket handles. Bushel crates consume birch, cherry, soft maple, ash, and elm. Soft maple is used for lettuce boxes and is available generally wherever truck gardening is extensive. Elm also forms bands for baskets. Yellow poplar, hard maple, and ash are used extensively for basket staves. White pine and spruce are preferred for the more fancy apple and fruit package, but their use has apparently fallen off tremendously. The large proportion of local raw material consumed throughout the State is noticeable, which results in the low average cost of $35.85 per thousand feet, the cost being lower than any other industry except excelsior.

TABLE 22

BASKETS AND FRUIT PACKAGES

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	8,527,000	100.00	$35 85	$305,746	7,499,000	1,028,000
Hard maple	2,327,000	27.29	$34 25	$79,700	2,079,000	248,000
Beech	2,183,000	25.61	39 05	85,246	2,035,000	148,000
Elm	1,761,000	20.65	36 37	64,049	1,532,000	229,000
Birch	748,000	8.77	33 15	24,796	673,000	75,000
Basswood	609,000	7.15	33 02	20,109	557,000	52,000
Yellow poplar	192,000	2.25	52 22	10,026	126,000	66,000
Ash	165,000	1.94	34 52	5,696	150,000	15,000
Black ash	125,000	1.46	32 00	4,000	30,000	95,000
Cottonwood	109,000	1.27	17 24	1,879	104,000	5,000
Chestnut	90,000	1.06	27 85	2,507	90,000	.....
White oak	56,000	.66	40 40	2,266	35,000	21,000
Cherry (black)	45,000	.53	24 55	1,105	45,000	.....
Red gum	45,000	.53	43 33	1,950	.....	45,000
Soft maple	38,000	.45	26 90	1,022	38,000	.....
Hemlock	10,000	.11	40 00	400	3,000	7,000
White pine	10,000	.11	40 00	400	2,000	8,000
Spruce	7,000	.08	41 00	287	.....	7,000
Southern yellow pine	7,000	.08	44 00	308	.....	7,000

VEHICLES AND VEHICLE PARTS

Great changes have taken place in this industry since 1912. The gasoline motor has effectively displaced the horse in the larger cities, both for pleasure driving and the purposes of delivery and hauling. A similar change has come about in the small cities and towns, though perhaps to a less extent, and the last remaining stronghold of the horse is for hauling and field labor on the farms, especially where roads have not yet been brought up to modern standards of excellence. Consequently the number of horse-drawn vehicles and the necessary repairs of such vehicles have decreased to a marked extent.

The former report (which included motor-drawn vehicles) accounted for over 30 million feet of wood consumed, while only one-fourth of that quantity is now reported by manufacturers of horse-drawn vehicles. In this report, Table 13, a separate statement of the wood used by automobile and truck

manufacturers has been presented, indicating a consumption of nearly 21 million feet in 1919. The total consumption for both horse-drawn and motor-driven vehicles is therefore slightly less than in 1912, and the latter industry has expanded at the expense of the former.

The general wagon industry includes all business and pleasure vehicles from the light delivery wagon of the bakery to the heavy trucks employed in hauling stone and timber, dump carts, sleighs, and trailers.

Vehicles drawn by horses consume the major portion of the raw material, but warehouse trucks, push carts, sleds, wheelbarrows, and small wagons are included in the industry.

Only a few firms in New York still actually make heavy wagons, carts, or sleighs from lumber. There is also at least one large plant which specializes on the manufacture of wooden wheels. Farm wagons and buggies are made by centralized plants in the middle west, and shipped complete. There are, however, shops which carry on an extensive business in assembling vehicles from finished and unfinished parts imported from other States.

Much of the heavy turned stock comes from the central southern States in a partly finished condition to be used for spokes, rims, shafts and tongues. In Arkansas and other central southern States many factories specialize in vehicle stock.

A large part of the industry now consists of local repair shops. Many of these call themselves wagon factories, but speaking accurately they never build a wagon, although some of them assemble completed parts, much as some piano factories do, and finish them.

Such shops are numerous in the large cities, and some of them also build delivery bodies for the transformation of old motor cars into trucks. It is therefore somewhat difficult to separate accurately the wood used for wagon repairs and for motor repairs.

As a general rule high-grade material is demanded. Clear stock of the best species of hard wood is in great demand, and increasingly difficult to get. It is noticeable that New York

woodlots still supply almost 50 per cent of the amount consumed. The manager of one factory states that for quality the New York-grown hardwoods, particularly hickory, have never been excelled. Therefore it will be of interest to state some of the requirements of the industry in order that the local sources of supply may align themselves with the needs.

Hickory is perhaps the most nearly indispensable wood in the United States, and none is known anywhere that will satisfactorily take its place for slender handles and certain parts of vehicles. Its scarcity is attracting national attention among wood users. Other woods should be substituted wherever possible and thus reserve the hickory supply for the production of such articles as depend entirely upon this species. Many parts of vehicles depend entirely upon hickory. Among its important uses are the following: Buggy poles, cross-bars, doubletrees, neck yokes, rims, shafts, singletrees, wagon gear (reaches), and small vehicle spokes. It is very strong, very heavy, very hard, and very stiff, and is capable of withstanding the severest thrust or twist. White oak and ash are now used in many places where hickory was deemed indispensable, except that they are used in larger dimension stock where resiliency and slenderness are not so important. Wagon hounds, felloes, bolsters, and poles are favorite uses for oak and ash. Yellow poplar is used along with several other woods for wagon boxes, and elm is a favorite material for hubs.

The form of the raw material required varies so greatly that details cannot be given. A few specifications for wagon stock will give a general idea of certain grades and dimensions required which should be supplied by local woodlots.

Article.	*Dimensions required.*
Wagon axles	Squares 2¾″ x 3¾″ to 6″ x 7″ and 6′ long.
Wagon bolsters	Squares 3″ x 4″ to 4″ x 6″ and in lengths 4′ 1″ to 4′ 6″.
Wagon reaches	Squares 2″ to 4″ to 2½″ x 5″ and in lengths 8′ 10″ to 14′.
Wagon poles	Squares 2½″ x 4″ tops to 4″ x 4″ butts and 12′ long to 3¼″ x 3¼″ tops to 3¼″ x 5″ butts and 12′ long.

Article.	*Dimensions required.*
Wagon eveners	Squares 2″ x 4″ to 2½″ x 5″ and in lengths 4′ 2″ 4′ 6″.
Singletrees	Squares for turning to be 2½″ x 3″ and 36″ long.
Neck yokes	Squares for turning to be 4″ x 4″ and 44″ to 48″ long.
Felloes	Squares for sawing may be made from short, clear cuttings 10″ to 14″ wide and from 24″ to 30″ long.
Hub stock	In the round for turning. Blocks to be 9½″ to 12″ in diameter inside of bark and 12″ to 15½″ long.
Spokes	Squares for turning to be approximately 2″ to 2½″ and 30″ in length.
Boxboards	9″ to 17″ in width and 12′ to 16′ in length.

The fact that the State still supplies nearly fifty per cent of the wood consumed is a tribute to the quality of the local supply. The displacement of hickory, which formerly occupied first place in the list, into the fifth place is a serious warning of the need of more general production of this well-nigh indispensable wood.

TABLE 23

VEHICLES AND VEHICLE PARTS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	7,660,000	100.00	$89 20	$683,270	3,690,000	3,970,000
Ash	2,697,000	35.20	$114 48	$308,753	940,000	1,757,000
Birch	1,290,000	16.84	50 19	64,745	1,067,000	223,000
Hard maple	886,000	11.57	63 84	56,562	497,000	389,000
White oak	785,000	10.25	86 85	68,177	560,000	225,000
Hickory	772,000	10.07	123 34	95,218	123,000	649,000
Elm	219,000	2.86	53 02	11,611	139,000	80,000
Basswood	213,000	2.78	38 68	8,239	151,000	62,000
Spruce	169,000	2.21	51 38	8,683	151,000	18,000
Red gum	165,000	2.16	125 00	20,625	.....	165,000
Southern yellow pine	132,000	1.72	98 09	12,948	.....	132,000
Buckeye	100,000	1.31	35 00	3,500	.....	100,000
Yellow poplar	91,000	1.19	158 55	14,428	10,000	81,000
White pine	77,000	1.01	74 62	5,746	17,000	60,000
Beech	43,000	.56	65 00	2,795	25,000	18,000
Chestnut	10,000	.13	40 00	400	10,000	.....
Loblolly pine	10,000	.13	75 00	750	.....	10,000
Cypress	1,000	.01	90 00	90	.....	1,000

Dairymen's, Poulterers' and Apiarists' Supplies

Table 24 includes beehives, bee supplies, butter ladles, butter moulds, butter tubs and pails, cattle stanchions, dairy supplies, cheese boxes, chicken coops, cheese vats, milk cases, egg carriers, and incubators. The production of cheese boxes consumes almost every species enumerated in the table. The consumption of home-grown wood is nearly two-thirds of the 7,556,000 feet reported and nearly all of the species are found in the State, the exceptions being western white pine and cypress. These imported woods are especially useful for certain articles; cypress, for instance, being particularly suited for incubators.

For egg carriers, used in transporting eggs by parcel post, yellow poplar is the favored material. Chestnut, formerly the leading wood in quantity, although restricted to use in incubators made by a few firms, seems to have fallen away in popularity.

For cheese boxes almost any wood can be used, either for headings, hoops, or staves, but the other products require wood of certain species. Beehives use white pine very generally for outer boxes, while basswood is preferred for honey boxes. Butter boxes are generally made of either spruce, yellow birch, hard maple or oak; and butter tubs are largely made of basswood, ash, white oak, red oak, spruce and hemlock. Cypress is demanded for tanks, tubs, well buckets, and other articles coming in contact with water. Elm is one of the more important woods for this class of products, used in the form of hoops and sides for cheese boxes, with a small amount for veneer for cheese-box siding. For cattle stanchions strong woods such as maple, beech, ash, and oak have been found best adapted.

The average cost of the raw material is $37.79, which is very low for the year 1919 and is accounted for by the fact that the industry consumes such material in the form of logs, the manufacturing consisting principally of simple reduction of billets and bolts into staves and heading suitable for local industries.

TABLE 24

DAIRYMEN'S, POULTERERS', AND APIARISTS' SUPPLIES

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	7,556,000	100.00	$37 79	$285,578	4,683,000	2,873,000
Basswood	2,749,000	36.38	$32 36	$88,958	2,052,000	697,000
Western white pine	1,003,000	13.28	55 00	55,165	.....	1,003,000
Hard maple	937,000	12.40	34 62	32,439	813,000	124,000
Elm	886,000	11.73	35 60	31,542	836,000	50,000
Chestnut	432,000	5.72	32 33	13,967	.....	432,000
Beech	345,000	4.57	36 91	12,734	308,000	37,000
Birch	315,000	4.16	27 41	8,634	315,000	.....
Yellow poplar	250,000	3.30	65 00	16,250	.....	250,000
Spruce	228,000	3.02	32 84	7,488	163,000	65,000
Cypress	156,000	2.06	54 89	8,563	.....	156,000
Hemlock	101,000	1.33	32 80	3,313	100,000	1,000
White oak	70,000	.93	37 22	2,605	27,000	43,000
White pine	49,000	.65	44 28	2,170	49,000	.....
Cottonwood	15,000	.20	15 00	225	5,000	10,000
Balsam fir	15,000	.20	80 00	1,200	15,000	.....
Red oak	5,000	.07	65 00	325	.....	5,000

TANKS AND SILOS

Table 25 includes silos, all kinds of water tanks, such as cisterns, vats, rough tanks, wagon tanks, sprinkling boxes, water troughs, and framework supporting tanks. The modern silo and its construction are important items in farm management today. Its history dates back to those of French construction sixty years ago. Several forms have been used, but the round silo is considered to be the most nearly perfect, being free from accumulations of decaying and poisonous ensilage in corners. Most silos in this country are made of wood, but the high price of wood has led to the substitution of other material, such as metal, stone, and cement. A typical silo has a diameter of about 16 feet, a height of 23 feet, and a capacity of 100 tons of ensilage, consisting of mixed corn, grain, and hay, which will feed about 30 cattle for 180 days. It requires about 114 staves and a total of about 3,000 feet of lumber to produce it. It is said that a silo will more than pay for itself in economy

RESULTS OF LUMBERING IN THE NORTHERN APPALACHIANS.

Hundreds of thousands of acres in New York and Pennsylvania look like this. When the people decide to abandon the old careless ways and enforce forest management, these lands can be made to produce better timber than the original [illegible]

the first year. Besides the great advantage of increasing the fattening capacity of the food there is the great economic saving of long daily trips for feed through the fields in mud, snow, and cold.

Retail lumbermen have developed a prosperous industry in farming communities. Formerly extensive silo manufacturers went into the south, purchased their lumber, manufactured the articles, and sold directly to the farmer through their agents. Today many retail lumberyards devote their slack time to the production of these farm articles. There is not much additional space required for the storage of a few silos within the lumberyards.

Bald cypress is the most desirable tank and silo wood. It is found in commercial quantities in Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, Missouri, North and South Carolina, Tennessee, and Texas. The cut has been far in excess of its slow growth. It is claimed for it that the wood imparts no taste and that it is sufficiently dense to prevent leakage, strong enough to withstand rough usage, and has the greatest capacity to resist dampness, excessive heat, and all the elements that hasten decay. Water and feed troughs for farm stock are made of it.

Owing to the high cost of cypress and the difficulty of transportation in 1919 somewhat more spruce than cypress was employed for this purpose, but this change may not be permanent.

Spruce is used largely as supports and framework for tanks. Hemlock, ash, and several other woods are also thus used. White oak goes into slats for tanks and water elevators or supports. White pine is used largely in the construction of ordinary rough tanks and for frame cisterns. One user of hemlock, spruce, fir, and cypress says that he could use New York spruce, white pine, and hemlock almost exclusively if he could secure them at competitive prices and in sufficient quantities for this industry. The form of stock that this industry uses ranges from 1 inch to 6 inches thick, most of it being 2 inches to 4 inches thick.

TABLE 25

TANKS AND SILOS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	7,471,000	100.00	$66 65	$497,950	632,000	6,839,000
Spruce	2,043,000	27.35	$54 46	$111,215	.....	2,043,000
Cypress	1,995,000	26.70	85 33	170,235	.....	1,995,000
Douglas fir	1,858,000	24.87	63 75	118,400	.....	1,858,000
White pine	677,000	9.06	60 52	40,975	257,000	420,000
Hemlock	450,000	6.02	44 33	19,950	350,000	100,000
Southern yellow pine	200,000	2.68	62 00	12,400	.....	200,000
White oak	85,000	1.14	126 47	10,750	.....	85,000
Yellow poplar	50,000	.67	100 00	5,000	.....	50,000
Arborvitae	40,000	.54	92 50	3,700	.....	40,000
Redwood	28,000	.38	92 86	2,600	.....	28,000
Chestnut	25,000	.33	35 00	875	25,000	.....
Southern red cedar	10,000	.13	125 00	1,250	.....	10,000
Tamarack	10,000	.13	60 00	600	.....	10,000

Toys

Toys may be divided into a dozen general classes as follows: Amusement, architectural, educational, games, household furniture, kitchen, musical, natural history, trade, wagons and sleds, watercraft, and wheelbarrows. The industry was slow to develop in the United States, because much of the work was done by hand in years past and America did not have the skilled workmen, and also because German manufacturers in the vicinity of Nuremburg had an advantage over the American employer in that they could employ German peasants who worked in their homes for almost nothing, thus enabling the German manufacturers to quote prices far below the cost of production in this country. With the advent of improved machinery, however, New York manufacturers found a field of good business venture along certain lines and embarked successfully upon the manufacture of toy blocks, dominoes, checkers, handsleds, children's wagons, doll carriages, coasters, toy shovels, carriages, etc.

As the result of the world war much of the former supremacy of Germany was taken from her in certain industrial lines, such as chemical manufactures. The toy business is another instance. America demanded toys, and was cut off from the German supply for several years. The result was a stimulation of this industry, which may be roughly measured by the increase in wood consumed, amounting to nearly 130 per cent. Our local factories, it will be noted, produce articles that are largely made of hardwoods and from raw material that comes in the form of lumber or small, sound strips. Much of our product may be made from the waste of certain larger industries, such as that from furniture factories. Some other classes of wood users report the sale of small-dimension waste to toy manufacturers, while others utilize their own waste by manufacturing toys. Manufacturers of piano actions, for example, report the use of a large amount of birch and basswood waste for toys and games. Thus, the toy industry is a natural by-product of wood-using industries and has become of great importance in New York, where wood-using industries are prominent and where problems of closer utilization are becoming of great interest. With modern machinery and raw material in abundance that is now practically waste, New York wood-users should make a close study of the opportunities afforded in this large and growing field of manufacture. Paris supplies many of the metal toys, Germany and other nations do much hand work, but there is an excellent field here for profit in closer utilization of wood waste.

Table 26 lists eleven species, all of which may be obtained in abundance in New York, and but one of which was purchased from outside the State entirely, yellow poplar having been shipped in from West Virginia. Hardwood toys have gained in importance of late years in response to the demand for more durable and substantial playthings. The species used must have the general qualities of being easily worked and of being tough. Much of the economy of utilization consists of preparing the stock in dimensions so that the machines, lathes, swing cut-off saws, rip saws, etc., may work on standard lines

and on pieces of wood that will turn out toys designed to utilize every inch of the wood. Toy blocks exemplify the most perfect utilization attained in toys, especially where a thin board is made into puzzles, and there is no loss of wood except the kerf loss of a very thin saw. Wood users could hope for no closer utilization than toys.

Table 26 shows the consumption of nearly 7,000,000 feet, approximately one-third of which is basswood. The principal product is children's wagons and carts, in which basswood forms largely the bottoms, while sugar maple contributes the seats and sides. In this branch almost all of the woods take part, red and white oak going into axles, spokes and rims, ash into spokes and frames, and chestnut into sled tops. Dominoes and checkers consume great quantities of sugar maple and basswood, one firm using basswood only for dominoes. Toy blocks are chiefly made of basswood and small amount of yellow poplar. Much of the birch used is paper birch and goes with basswood into toys and games. Toy snow shovels, and garden tools, in imitation of the man's working implements, utilize mainly white ash, just as do the large hoe and fork-handle plants. A small amount of yellow poplar is also used in these manufactures.

TABLE 26

Toys

Kind of Wood	Quantity Used Annually		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	6,864,000	100.00	$45 79	$314,313	3,195,000	3,669,000
Basswood	2,315,000	33.72	$51 71	$119,699	900,000	1,415,000
Ash	1,500,000	21.86	51 00	76,500	600,000	900,000
Hard maple	1,253,000	18.26	40 88	51,223	1,000,000	253,000
Red gum	650,000	9.47	33 46	21,749	.....	650,000
Beech	353,000	5.12	37 57	13,262	350,000	3,000
Chestnut	260,000	3.79	40 77	10,600	100,000	160,000
Yellow poplar	250,000	3.65	35 00	8,750	.....	250,000
Birch	138,000	2.01	40 00	5,520	135,000	3,000
Red oak	100,000	1.46	50 00	5,000	100,000	.....
White oak	40,000	.59	45 00	1,800	10,000	30,000
White pine	5,000	.07	42 00	210	.....	5,000

Picture Frames and Moldings.

The products included in Table 27 are mirror frames, picture frames, mirror backs, picture moldings, and picture backs. As can be seen by the nature of the article produced, there is comparatively little waste. Indeed, much of the material consumed by this industry is the waste of the larger woodworking establishments, such as planing mills products, sash, doors, blinds and general millwork. While the latter establishments sometimes produce these smaller articles from the waste of their mills, there are many minor plants in the cities and towns that specialize in such articles. A great many of the small picture-frame shops of New York buy their moldings from molding factories in Chicago, with the finish already on them. The total of 6,647,000 feet is probably far short of the total consumption for such articles in the State, but the real consumption of wood cannot be separately shown because planing mills and general millwork establishments make their reports without distinguishing the exact amount going into such by-products. These figures indicate, however, that the aggregate production of the State for picture frames and moldings is enormous when such a large total can be accounted for through the reports of the small specialty factories. The industry consumes 14 woods and pays the average price of $83.57 per M. feet f. o. b. factory.

Yellow poplar is by far the most important species contributing to the industry, white oak having fallen to fourth place in quantity consumed. Basswood is reported in second place. Other woods that are used entirely for moldings are sugar maple, mahogany, and black walnut. White pine is suitable both for the facing and for the backs of picture frames because it is light and very workable. When used as moldings it takes oils, paints, and enamels well. The white oak is generally stained in such a way as not to interfere with the naturally pleasing appearance of the grain of the wood. It is generally quarter-sawn from No. 1 stock free of defects. Birch, chestnut, sugar maple, red gum, mahogany, black walnut, and

cherry are popular in the manufacture of hand mirrors where both the facing and backing must be highly ornamental. The industry is rapidly growing in the State and the consumption is far in excess of the amount reported in any other State for such articles.

The amount of wood reported as consumed has decreased only 11 per cent since the previous report, but the amount of raw material supplied by the State has decreased by 90 per cent.

In 1912 the State imported two-thirds of its picture frames and moldings. In 1919 it imported thirty-three times as much of the material as it supplied, though 77 per cent of the wood is of species indigenous to New York.

TABLE 27

PICTURE FRAMES AND MOLDINGS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	6,647,000	100.00	$83 57	$555,474	186,000	6,461,000
Yellow poplar	1,784,000	26.83	$63 29	$112,909	.....	1,784,000
Basswood	1,401,000	21.07	64 66	90,590	135,000	1,266,000
Red gum	902,000	13.57	88 13	79,493	.....	902,000
White oak	900,000	13.53	93 42	84,078	15,000	885,000
Cypress	465,000	7.00	76 87	35,745	.....	465,000
Birch	262,000	3.94	185 14	48,507	28,000	234,000
Witch hazel	240,000	3.62	62 00	14,880	.....	240,000
White pine	208,000	3.12	80 31	16,704	5,000	203,000
Hard maple	144,000	2.18	136 44	19,647	3,000	141,000
Chestnut	140,000	2.11	56 78	7,949	.....	140,000
Mahogany	134,000	2.03	277 77	37,221	.....	134,000
Ash	50,000	.75	80 00	4,000	.....	50,000
Black walnut	16,000	.24	228 33	3,653	.....	16,000
Cherry (black)	1,000	.01	98 00	98	.....	1,000

PLUMBERS' WOODWORK.

A few firms specialize in the production of woodwork for the plumbing industry in the State. The industry includes toilet tanks, seats, washtray frames, drain-boards, bathroom cabinets, and general plumbers' equipment. Formerly the

bath tub was the principal wooden article manufactured, but the advent of the more sanitary metal substitute for bath-tub material brought about a decrease in the total consumption of wood. Other articles, such as toilet tanks, grew in importance for a while, but are now being replaced by china or metal construction. The utilization of wood in this class of goods still makes the industry a factor in the sales of high-grade oak. White oak together with birch (the latter often being stained in imitation of mahogany) supply the closet toilet seats and fronts or visible parts of the tanks. Ash is a favorite wood for seats, tanks, washtray rims or frames. Chestnut is reported for use as backs for tanks. Sugar maple is used extensively for bathroom cabinets and minor equipments. The white pine goes mainly into drain boards.

Since the woodwork is relatively a very minor item in the plumbing industry in New York, the 5,424,000 feet reported is indicative of a very large manufacturing business in the State. The increase of over 200 per cent in the amount of wood consumed is probably an evidence of the extension of more and better plumbing in residences of all grades. The average cost of $85.13 per thousand feet for the raw material used by this class of manufactures is an increase of $47.79 per thousand since 1912.

TABLE 28

PLUMBERS' WOODWORK

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	5,424,000	100.00	$85 13	$461,792	1,170,000	4,254,000
White pine	2,340,000	43.14	$44 00	$102,960	1,170,000	1,170,000
White oak	1,110,000	20.47	120 00	133,200	.....	1,110,000
Ash	950,000	17.51	80 00	76,000	.....	950,000
Cypress	284,000	5.23	38 00	10,792	.....	284,000
Birch	280,000	5.16	270 00	75,600	.....	280,000
Beech	200,000	3.69	110 20	22,040	.....	200,000
Hard maple	200,000	3.69	125 00	25,000	.....	200,000
Chestnut	60,000	1.11	270 00	16,200	.....	60,000

Any one firm, no matter how large, is scarcely justified in obtaining the raw material in large quantities, and almost all of the stock is purchased from wholesale dealers in the larger centers, who have to select good, clear stock and charge somewhat extra for the culling process necessary to oblige plumbing establishments.

Pumps and Piping

The manufacturers of pumps in the State consumed 4,833,000 feet of lumber and expended $226,000 for their wood, an average price of $46.84 per thousand. The comparatively low average price is due to the use of much stock in the rougher platforms and coverings where ordinary grades of lumber will suffice. All of the wood used in this industry cannot be accounted for in a wood-using study. To begin with, metal substitutes of all parts of pumps, including piping, rods and handles, has become so general that the proportion of wood to the total raw material consumed by the industry is relatively unimportant. Many large pump manufacturers are not even listed as wood-using establishments and their utilization of wood is necessarily lost sight of in this study. Again, some pump-handle stock is doubtless accounted for in the returns from handle factories and cannot be identified as pump handles. The amount of wood reported is about 50 per cent less than was used in 1912.

TABLE 29

Pumps and Piping

Kind of Wood	Quantity Used Annually		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	4,833,000	100.00	$46 84	$226,388	866,000	3,967,000
White pine	4,530,000	93.73	47 57	$215,492	713,000	3,817,000
Hard maple	301,000	6.23	36 00	10,836	151,000	150,000
Ash	1,000	.02	30 00	30	1,000	.....
White oak	1,000	.02	30 00	30	1,000	.....

White pine overshadows all other species and supplies 93 per cent of the raw material, the major portion of it going into steam pipe casing, water pipes, pump tubing, siding, curbing and covering. Well buckets are made of white oak, ash, and beech; water pipes of white pine and maple.

Laundry Appliances.

The figures combined in Table 30 include the reports of establishments using wood for the manufacture of clothes hampers, clothes pins, clothes racks, clothes wringers, curtain stretchers, ironing boards, laundry mangles, sleeveboards, washboards, washtubs, washing machines, frames of washing machines, and miscellaneous equipment for the general laundry business, such as spiral tables, benches, tanks, rollers for handles, etc.

The tub and tank parts of the industry consume the greater amount of wood and this accounts for the large amount of bald cypress reported, its contribution being 71 per cent of the quantity used, nearly all of which went into tanks and tubs. This species has the commendable quality above all others of resisting decay in contact with water.

The next most important item is that of washboards, made of beech and sugar maple. The advent of the electric washer has greatly reduced the production of hand-washing equipment, including old-style tubs and corrugated boards. Clothes pins are made largely of hard maple and beech. Reels for machinery consume a small amount of hard maple. Special kinds of tables and boards needed for laundry offices and workrooms consume white pine and yellow poplar. For many uses sugar maple takes precedence over all other woods, including such articles as wheel repairs and all kinds of handles used in connection with the laundry business. It is very important for mangle rollers. General machine construction for laundries consumes cypress, sugar maple, poplar, and white oak.

New York stands well to the fore in this industry, but it is regrettable to note that the manufacturers imported all of the material used, although cypress is the only species not grown in the State.

TABLE 30

LAUNDRY APPLIANCES

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	4,241,000	100.00	$59 23	$251,189	.....	4,241,000
Cypress	3,010,000	70.97	$60 85	$183,159	.....	3,010,000
White pine	1,000,000	23.57	52 22	52,000	.....	1,000,000
Hard maple	90,000	2.13	72 00	6,480	.....	90,000
Beech	75,000	1.77	60 00	4,500	.....	75,000
White oak	50,000	1.18	85 00	4,250	.....	50,000
Yellow poplar	16,000	.38	50 00	800	.....	16,000

TRUNKS AND SUITCASES.

New York is prominent in the manufacture of trunks, her consumption of 3,984,000 feet b. m. placing the State among the leaders. The principal centers of manufacture are Binghamton, Buffalo, Rochester, Utica, and New York. In New York the trunk slats are made of white elm and white ash; the backs are made of basswood, white pine and red gum; white elm and white ash supply the clips and cleats, while basswood is the chief material for trays. Most of the body of the trunk is made of wood, but very little is visible except the strengthening slats, which are placed transversely or longitudinally to brace the body. These slats are preferably made of white ash because this wood is strong, elastic, and not easily split. The body of the trunk, the tray, and partitions should be of the lightest woods that possess in a moderate degree the qualities of toughness, strength, and elasticity. Many woods that possess these qualities are apt to warp greatly, a very objectionable quality in trunk lumber. Basswood is preferred by New York manufacturers for the manufacture of family trunks. The wood is not strong enough for heavy sample cases used by commercial travelers. These are usually made of built-up wood with the grain alternately crossed and firmly glued. Originally white pine and basswood were the

principal woods used by trunk manufacturers, but lately they have tried yellow poplar, cottonwood, cypress, and other similar woods. Manufacturers are now having difficulty in getting poplar and cottonwood of proper dimensions, while basswood is becoming very very hard to get. Although not reported in time for inclusion in the table it is known that large quantities of three-ply built-up panels of red gum and also of western yellow pine are used for trunk construction.

Over 90 per cent of the wood reported came from outside the State, all of the species mentioned (except gum) being native to New York forests. The high average price of $82.16 per thousand results in part from the freight charges on long hauls. Why not grow basswood at home?

TABLE 31

TRUNKS AND SUITCASES

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	3,984,000	100.00	$82 16	$327,430	185,000	3,799,000
Basswood	2,244,000	56.32	$104 30	$234,049	130,000	2,114,000
White pine	1,620,000	40.66	52 76	85,471	.....	1,620,000
Ash	90,000	2.26	68 33	6,120	30,000	60,000
Birch	25,000	.63	60 00	1,500	25,000	.....
Elm	5,000	.13	58 00	290	.....	5,000

CIGAR BOXES.

The cigar-box industry is one that consumes a small variety of woods. Spanish cedar, as will be noted, supplies 57 per cent of the 3,295,000 feet consumed. Cotton gum or tupelo, as it is sometimes called, is the only other wood of importance from the standpoint of quantity. Spanish cedar is generally converted into very thin lumber or veneer and used as an outside material with other woods as cores or backing. A very small amount of cotton gum and yellow poplar are made into boxes without being overlaid with cedar. Generally the

Spanish cedar is glued on the cheap domestic woods, such as yellow poplar; but the great body of cigar-box material is in the form of two-ply veneer with Spanish cedar as principal wood for this use. Except for cheaper boxes, Spanish cedar is used almost exclusively. It is bought by superficial measure, usually between 1/8 and 3/16 of an inch in thickness. For purposes of showing comparison of quantities, the veneer has been reduced to board measure, which accounts for the high price of $175 per thousand feet. Spanish cedar is best for cigar boxes not only because of its beautiful grain and fine texture, but because of its aromatic odor. The gum, yellow poplar, and other imitations are stained to give the proper color, while the odor is artificially applied by treating the veneered lumber with a decoction of cedar shavings and sawdust. Cotton gum is sometimes made to imitate the Spanish cedar by passing the thin lumber between rollers having minute teeth by which the wood is indented so that it has the appearance and characteristics of cedar.

The industry has comparatively little waste because most of the lumber can be used by thin slicing of the board or log, and by using the cedar shavings and sawdust in covering other woods. Most of the Spanish cedar is imported from Mexico, Central America, and the West Indies. This is the only extensive industry in the State that draws on the outside world for every foot of its raw material. Next to airplanes this industry paid the highest price for its raw material, the average being $164.66 per thousand feet, while airplane material costs $230.34 per thousand. The high price of the material going into the industry is realized when we compare its cost with the average of 60.78 for all industries in New York State.

The saw mills supplying cigar-box lumber generally take the round logs in the rough and manufacture dimension stock sawed to thickness and width but random length, and shipped in the rough, wet or air-dried, and planed as the consumer of the material desires. The dimension stock is frequently cut into multiples of the sizes desired for specified cigar boxes. Every inch of lumber that is available from the log for cigar

boxes is used up to the point where the value of labor and the value of the stock balance. In the vicinity of New York City and other large municipalities of the State the sawdust and shavings from a large mill are sometimes sold on a monthly contract at a fair price to concerns who sort and regrade and who job in sawdust and shavings. Spanish-cedar sawdust is used for smoking meat, lining ice boxes, and making explosives. No other industry in the State utilizes more closely the raw material brought into the factory. New York is one of the largest importing States for logs and rough stock of this kind, and close utilization for by-products is essential to economical administration of the plant engaged in this industry. The high cost of the stock compels economy, and the same influences will apply more and more to other industries hereafter.

TABLE 32

CIGAR BOXES

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	3,295,000	100.00	$164 66	$541,859	.....	3,295,000
Spanish cedar	1,849,000	57.32	$175 40	$331,331	.....	1,849,000
Tupelo	601,000	18.23	141 52	85,054	.....	601,000
Yellow poplar	350,000	10.63	140 90	49,315	.....	350,000
Red gum	338,000	10.26	164 11	55,469	.....	338,000
Basswood	100,000	3.04	175 40	17,540	.....	100,000
Redwood	17,000	.52	185 30	3,150	.....	17,000

PATTERNS AND FLASKS

Table 33 includes general flask patterns, foundry patterns, hat blocks, machine shop patterns and models. The industries reporting the data include agricultural implement plants, iron working establishments, railroad shops, locomotive works, electric power companies, and general manufacturing establishments. A few firms are engaged exclusively in the manufacture of patterns, hat blocks, and flanges for hat blocks, while

other establishments have pattern departments for the exclusive use of their own plants. General foundries and railroad shops have thir own pattern departments. Much of the raw material consumed, however, is reported by the general manufacturing establishments that have no pattern departments in the strict meaning of the term.

Pattern makers need a soft, workable wood for forms such as hat blocks and pressing blocks, and generally demand a high-grade stock of yellow poplar, basswood, or white pine. White pine contributes nearly 70 per cent of the raw material consumed in this industry and its average price f.o.b. factory is $72.21. It is used in every kind of establishment reporting and cannot be identified as particularly preferred as a pattern wood for any special kind of article. Yellow poplar, however, is especially suitable for hat blocks. The lower priced woods reported, such as beech, birch, and hemlock are used for the roughest purposes in connection with general foundry and machine shop work.

Maple and white oak are used for all kinds of patterns and models because of their capacity to resist the wearing action of sand. Cherry is regarded as a high-grade pattern wood. The stock required for patterns is usually plain, rough, clear, 1 to 2 inches thick, while the models demand a clear surfaced stock ¼ to 4 inches thick. There is comparatively little waste in the industry because dimensions include very short lengths.

As in the trunk industry it appears that there is a notable falling off in the quantity of basswood used. This valuable species was once common in certain counties, such as Sullivan and Delaware. One manufacturer took pains to state that New York-grown basswood is superior in texture, color, and quality to that from northern, southern, or western sources. It grows faster and larger than that from Canada, finishes better than the "linn" of the South, and in drying loses none of its elasticity. Apparently this is a wood which New York woodlots should produce to great advantage. At present the freight charges on basswood from other States add $7.50 per thousand to its cost.

TABLE 33

PATTERNS AND FLASKS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	3,039,000	100.00	$75 95	$230,809	219,000	2,820,000
White pine	2,109,000	69.39	$72 21	$152,281	30,000	2,079,000
Hard maple	373,000	12.28	85 70	31,966	136,000	237,000
Yellow poplar	359,000	11.82	75 00	26,925	.....	359,000
Southern yellow pine	50,000	1.65	73 00	3,650	.....	50,000
Cherry (black)	30,000	.98	143 28	4,298	10,000	20,000
Mahogany	24,000	.78	241 52	5,796	.....	24,000
Sugar pine	20,000	.65	100 00	2,000	.....	20,000
Birch	20,000	.65	50 00	1,000	20,000	.....
Hemlock	20,000	.65	41 00	820	8,000	12,000
Beech	10,000	.34	40 00	400	10,000	.....
White oak	5,000	.17	60 00	300	5,000	.....
Ash	5,000	.17	58 00	290	.....	5,000
Basswood	5,000	.17	78 00	390	.....	5,000
Locust	5,000	.17	80 00	400	.....	5,000
Spruce	3,000	.10	71 00	213	.....	3,000
Cypress	1,000	.03	80 00	80	.....	1,000

BRUSHES AND BROOMS

Table 34 includes brush backs, small brush and duster handles, and broom splints. The figures are separate from those showing the general production of Handles, the latter being a very large industry in the State. Most of the products of the following table are small articles used in the household and for the care of the person. An exception is in the broom splint, which is a long, thin sliver of wood used in coarse brooms for sweeping. Backs of hand mirrors form part of the industry, although the larger mirror backs, made of cheaper woods, are reported under picture frames and moldings. The backs of hand mirrors are of high-grade stock similar to the stock used for brushes. Both mirrors and brushes are often real works of art, made of ebony, mahogany, satinwood, holly, cherry, walnut and birch, and very ornamental, being turned into varied forms. Paint brush blocks are made of maple, beech and birch, named in the order of their importance. Wood for

brushes must be very strong and tough and have the capacity to resist splitting when nailed or bored. The woods are used interchangeably in the production of so many of the articles reported that no conclusion can be drawn relative to the special qualities demanded for many of the uses. Hard maple, however, while used for all of the articles, is the only one reported for the production of broom splints. Duster handles consume hard maple, beech, birch and cherry. Generally speaking, maple, beech and basswood go mainly into the rougher, unpolished handles, while the others are used in the manufacture of ornamental or high-grade articles. Beech is particularly recommended for backs of scrub brushes and stable brooms, and whitewash and kalsomine brushes. Much of the birch is white birch which is bought in the form of boards, bolts, and partly finished blocks.

The low average cost of $43.19 for the 2,713,500 feet consumed is the result of the large amount of woods going into the

TABLE 34

BRUSHES AND BROOMS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	2,713,500	100.00	$43 19	$117,208	2,124,000	589,500
Hard maple	1,127,000	41.54	$26 56	$29,933	1,063,000	64,000
Birch	895,000	32.97	42 05	37,634	629,000	266,000
Beech	334,000	12.30	41 01	13,704	297,000	37,000
Basswood	151,000	5.57	27 00	4,077	120,000	31,000
Holly (American)	38,000	1.40	150 00	5,700	.....	38,000
Mahogany	30,000	1.11	60 00	1,800	.....	30,000
Cherry (black)	27,000	1.00	36 66	990	6,000	21,000
Black walnut	24,000	.89	170 00	4,080	.....	24,000
Elm	21,000	.77	85 00	1,785	.....	21,000
Cottonwood	20,000	.74	17 00	340	.....	20,000
Rosewood	19,000	.71	120 00	2,280	.....	19,000
Ash	9,000	.33	25 00	225	9,000	.....
Satinwood	5,000	.18	980 00	4,900	.....	5,000
Cocobola	5,000	.18	950 00	4,750	.....	5,000
Ebony	5,000	.18	920 00	4,600	.....	5,000
Yellow poplar	2,000	.07	95 00	190	.....	2,000
White oak	1,000	.04	95 00	95	.....	1,000
Boxwood	500	.02	250 00	125	.....	500

rougher articles such as broom splints. Of the eighteen kinds of wood reported the native species were quoted by manufacturers at prices so low as to suggest that parts of the stock were purchased before the war conditions raised the cost. On the other hand the foreign luxury woods — satinwood, cocobola, and ebony — cost upward of $900 per thousand.

Shuttles, Spools, and Bobbins

New York is becoming increasingly important in this industry with a consumption of considerably over 2,000,000 feet of beech, maple, birch, yellow poplar, basswood, and dogwood which cost nearly $100,000 in 1919. The quantity consumed and the price per thousand are almost exactly double the amounts reported in 1912. The industry as reported in New York does not include shuttle blocks, which are commonly made of dogwood and persimmon.

Bobbins are reels used to hold yarn or thread, having a hole bored through their length by which they may be placed on a pivot and used on spinning or warping machines. The rough stock is generally small dimension squares of birch, beech, sugar maple, and dogwood. The manufacture of spools is more peculiarly a New England industry, and is centered in Maine. Spool factories of that State turn out very large quantities of spools annually. Good quality white birch is used very extensively. It reaches the factory in small squares from short lengths up to four feet and free of all defects. The birch is cut in winter and sawed by small portable mills which operate along the railroad lines. One thousand feet of bars require about two and one-half cords of wood. At the portable mills the bars are piled criss-cross for thorough seasoning. In June the stock is ready for shipment to factories. The machines for making spools are complicated. The finished articles drop from the lathe at the rate of about one per second, and are perfectly uniform and true. Finished spools are marketed largely in the northeast.

In this industry beech is listed as the leading wood, a large amount of which is used in making reels for the cordage and

textile trade. Maple, the next wood in amount used, is made into spools, bobbins, and reel work. Yellow poplar is used for spool heads, basswood for reels, and dogwood for bobbins and spool heads. Beech, maple, and birch — the important Adirondack hardwoods — are still the leading woods in this industry, but notwithstanding the fact that these woods are native, still a little over 50 per cent came from outside the State. In 1912 the State supplied three-fourths of the amount used.

TABLE 35

SHUTTLES, SPOOLS, AND BOBBINS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	2,310,000	100.00	$42 55	$98,280	1,125,000	1,185,000
Beech	1,000,000	43.28	$35 00	$35,000	500,000	500,000
Hard maple	750,000	32.36	45 00	33,750	350,000	400,000
Birch	400,000	17.31	44 00	17,600	200,000	200,000
Yellow poplar	60,000	2.47	53 00	3,180	.....	60,000
Basswood	50,000	2.29	35 00	1,750	50,000	.....
Dogwood	50,000	2.29	140 00	7,000	25,000	25,000

ELECTRICAL MACHINERY AND APPARATUS

Some of the largest electrical supply houses of the Nation are located in this State. While these establishments work primarily in metal, yet they consumed 2,216,000 feet of lumber in 1919.

This material is used in the manufacture of signal devices of which the railroads are large consumers, and in making parts of electrical machines and devices, such as base blocks, switch handles, and other small parts. The report for 1912 included material used for wire reels, under "Electrical Machinery and Apparatus." In this report it has been thought best to place reels under the "Miscellaneous" heading. These reels which formerly drew heavily upon spruce are now using much beech. In 1912 there was a total of 4,602,860 feet of

all species reported as used in the industry. The amount today is only one-half as great, but a large amount can be accounted for in the reel industry. Consequently the use of wood in this electrical industry is not decreasing as much as it would appear from Table 36.

Pine, arborvitae, and cypress are used mostly for signal devices because they can resist severe weathering conditions. Hard maple makes excellent baseboards for all kinds of small electrical instruments.

In 1912 23 species were reported in use and now but 7 are listed. This is a marked falling off in variety. Although 95 per cent of the wood used is native to New York only about one-third of the white pine reported was home grown, while all the other species are reported as imported. The average price has risen from $29.10 to $70.94, a large increase due partly to the reclassification of reels, which can use lower and therefore cheaper grades of wood.

TABLE 36

ELECTRICAL MACHINERY AND APPARATUS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	2,216,000	100.00	$70 94	$157,209	162,000	2,054,000
White pine	684,000	30.86	$49 92	$34,145	162,000	522,000
Hard maple	597,000	26.95	74 00	44,178	.....	597,000
Ash	420,000	18.95	84 55	35,511	.....	420,000
Soft maple	200,000	9.03	70 05	14,010	.....	200,000
Arborvitae	200,000	9.03	110 00	22,000	.....	200,000
Cypress	100,000	4.51	60 90	6,090	.....	100,000
White oak	15,000	.67	85 00	1,275	.....	15,000

MACHINE CONSTRUCTION

Table 37 is made up of reports from the establishments that manufacture and repair machinery of various kinds. The uses of wood in such establishments are confined principally to sills, bases, platforms, bins, walks, bodies, cabs, and other

parts of machines that are made largely of metal. It is impossible to obtain complete data from the innumerable machine works that use small amounts of wood. Unless the establishment buys as much as a carload during a season it can scarcely be called a wood-using plant; yet the aggregate of consumption by machine shops and foundries, and general metal-manufacturing industries, would doubtless be many times the total reported in Table 37.

The principal items reported come from manufacturers of road-building machinery, ice and coal-handling machinery, hoists and cranes, looms, rice and coffee machinery, wood-sawing and wood-working machinery and tractors. Some kinds of machinery require but a small amount of wood, while others use considerable quantities.

Sugar maple, as in 1912, is still the leading wood in machine construction, though only half as much is used now as formerly. Hemlock, which in 1912 took second place, is today in ninth place at a cost of $50.00. Seven years ago it cost $15.55. Yellow poplar, formerly in third place, is now in second place. White pine formerly in sixth place is now third. The first report listed red oak, hickory, and cottonwood. In 1919 they were not reported and chestnut appears as a new wood. This slight change in species shows a marked stability in the preferences of the industry.

The total amount consumed decreased from 4,555,900 feet to 1,779,000 feet, while the average price increased from $34.37 to $53.76, which is not a remarkable rise compared with other industries. More of the raw material came from without the State than from New York, while in 1912 nearly twice as much was home-grown as was imported from other states. The only species reported which cannot be grown in New York are southern yellow pine and cypress. The stock used in this industry is mostly for heavy work, with thicknesses from 1 inch to 8 inches and upward.

TABLE 37

MACHINE CONSTRUCTION

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	1,779,000	100.00	$53 76	$95,644	812,000	967,000
Hard maple	295,000	16.58	$43 71	$12,894	278,000	17,000
Yellow poplar	266,000	14.95	80 90	21,519	.....	266,000
White pine	212,000	11.92	59 03	12,514	127,000	85,000
White oak	175,000	9.83	43 07	7,537	161,000	14,000
Basswood	144,000	8.09	56 66	8,159	21,000	123,000
Spruce	122,000	6.86	49 00	5,978	.....	122,000
Beech	119,000	6.69	32 91	3,916	60,000	59,000
Ash	91,000	5.13	56 35	5,128	28,000	63,000
Hemlock	85,000	4.78	50 00	4,250	30,000	55,000
Southern yellow pine	71,000	3.99	58 88	4,180	.....	71,000
Birch	59,000	3.31	33 33	1,966	45,000	14,000
Elm	50,000	2.81	34 80	1,740	50,000	.....
Loblolly pine	43,000	2.42	71 00	3,053	.....	43,000
Cypress	31,000	1.74	73 87	2,290	.....	31,000
Chestnut	12,000	.68	30 00	360	10,000	2,000
Cherry (black)	2,000	.11	40 00	80	.....	2,000
Soft maple	2,000	.11	40 00	80	2,000	.....

PULLEYS AND CONVEYORS

There are so many different kinds of pulleys and conveyors that a detailed discussion is impracticable in a report of this kind. Table 38 contains the data relative to two rather distinct classes of articles, the one having to do with the amount of wood consumed for the conveyance of belting, while the second class shows the amount consumed in the manufacture of "tackle blocks" and tackle-block shells used for construction purposes.

Pulleys were formerly very crude articles consisting of rough boards nailed and glued together. With the development of modern mechanics, great ingenuity was brought to bear on his branch of shop equipment and several factories put improved wood pulleys on the market. It required much time to construct them properly and for a while iron made great inroads as a substitute. Good dry-kilns, modern woodworking machinery, and special lathes developed the modern wood

pulley, with interchangeable bushings. It has certain advantages generally recognized. The wood is much lighter than iron, much less apt to break through high-speed centrifugal force, it does much less injury in the event of a break of a large fly-wheel and complies with the insurance and accident regulations of many States. On the other hand, the iron pulley has some advantages, one of them being that it does not warp or twist so much as wood in outdoor places and where exposed to extreme moisture. The general class of pulleys and conveyors consists of the larger fly-wheels in factory work and what are known as "cone pulleys" or graduated steps or blocks on which the smaller leather belts are carried. Large fly-wheels 20 to 30 feet in diameter and 5 to 9 feet across the face are built up with a great deal of care. The lumber entering these large wheels must be thoroughly kiln-dried in order to hold its shape, and many courses of lumber are necessary to build up these wheels which are subjected to great centrifugal strains at high speeds.

Cone pulleys to be really strong and serviceable need to be "built-up" also, on a regular raceplate and of very thin material. The article thus produced is non-shrinkable and designed to stand the wear and tear of many years. The smaller ones generally consist of at least six segments. White pine may be used because it takes glue well and holds nails without splitting, but in New York hardwoods are preferred. Maple will stand very satisfactorily the severe wear and tear of the industry.

Tackle-block shells use a large part of the raw material in this industry. They are the hollow forms in which metal strips and rollers are placed for lifting heavy weights, their usefulness consisting of their capacity to multiply the pulling power of machinery and animals. Metal has been used extensively for the smaller block shells, but in the larger compound tackle blocks metal is entirely too heavy. Wood is generally recognized as the most satisfactory tackle-block shell.

Birch is the wood reported as used to the greatest extent in the manufacture of tackle-block shells, nearly one-half of the amount reported having been devoted to this purpose. Ash

was the wood formerly used; but, because of increased prices and difficulty in obtaining required widths, birch has been substituted. Good block wood should be straight-grained and easy to work, should air-dry readily, and have a good color when covered with shellac. Also it should not warp, twist, or check when cross-cut into small pieces.

The Adirondack hardwoods and basswood contribute heavily to this industry, red gum being the only wood which is not native in New York, but in spite of this fact little of this wood is reported as home-grown. This industry has nearly doubled in amount of lumber used since 1912, while the number of manufacturing plants is the same. These facts seem to indicate that there has been an increase of industry and that metal substitutes are not making an inroad upon wood in this field. The average price paid in 1912 was $46.45, while in 1919 it was $53.42, a surprisingly small increase. Lignum-vitæ, beech, and ash were reported in 1912; but these are absent now, while basswood and red gum have been introduced.

TABLE 38

PULLEYS AND CONVEYORS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	1,614,000	100.00	$53 42	$86,221	33,000	1,581,000
Birch	700,000	43.38	$66 00	$46,200	18,000	682,000
Hard maple	427,000	26.46	45 04	19,232	15,000	412,000
Basswood	250,000	15.48	45 00	11,250	.....	250,000
Red gum	237,000	14.68	40 25	9,539	.....	237,000

AIRPLANES

The industry which has made the most rapid strides since 1912 is airplane construction. In 1912 this industry reported 31,400 feet of lumber, used by three manufacturers, while in 1919, 1,427,000 feet are reported as used by five manufacturers. If this study had been made during the war the quan-

tity would have been very much larger, and instead of five builders of airplanes and airplane parts dozens would have been listed. Although the airplane industry is still in the formative period, it is certain that it has come to stay. Some manufacturers believe that metal will be substituted for wood to a very large extent, while others are uncertain whether, after a trial of substitutes, wood will not yet be the substance finally chosen as the best all-round material.

The airplane industry is highly specialized, each firm getting many of its parts from numerous other makers. Not only must the workmanship of a plane be of the highest grade and very carefully inspected, but the wood used must be of the very best quality possible to obtain, and selected with the utmost care. At the opening of the war the industry knew little about the proper kiln-drying of airplane wood, the proper construction of laminated or built-up parts, the proper use of glues, the detection of hidden defects, and the weakening effect of spiral grain. All of these points and many more were studied during the war, especially by the Forest Products Laboratory of the United States Forest Service, at Madison, Wisconsin, where a large force of men with good equipment was constantly at work to help perfect military planes. Considerable quantities of veneer are used in airplanes; but this material does not appear in the table, veneers being discussed in the appendix.

Strength and lightness are two prime requisites of the airplane, and the woods used are selected on that basis. The cost of the wood is a secondary consideration. In order to obtain certain qualities, laminated wood, always stronger than single grain, was resorted to and cut from clear stock of the species listed in the table.

Sitka spruce, which is abundant in Washington and Oregon, contributed over two-thirds of the wood reported. This wood is favored because it is more uniform than many others. It contains few hidden defects and surface indications are generally a good criterion of the quality of the piece. It is possible that some eastern red spruce from the Adirondacks

has been reported as Sitka spruce, but the quantity is relatively small. Sitka spruce is a much larger tree and yields larger pieces of clear stock.

During the war period experts searched the Adirondacks for air-plane spruce, as it was termed. These men worked at spruce operations, marking logs which they thought were of airplane quality. Generally the butt log only was chosen from the tree, as the next log above was often knotty. The logs had to be not only free from knots and other defects but straight-grained as well. The grain of a board generally shows, but it is an entirely different matter to tell whether a tree will cut clear boards as it stands on the stump. Straight-grained spruce trees can, however, be chosen with a high percentage of accuracy after a considerable amount of practice and close inspection and a checking up of results. A study carried on in the Adirondacks during the war period shows that on the areas examined 52 per cent of the trees were straight-grained enough to pass the airplane specifications; but, because of knot conditions, few trees under 14 inches in diameter were of value, and of these trees about one-third were defective from other causes. Consequently the amount of timber actually available for airplane purposes in the Adirondacks is probably comparatively small.

Spruce is used largely in the fuselage shell, wing beams, wing posts, cap strips, engine beds, struts, and all other beams. Ash is used to a large extent in longerons and in parts requiring toughness and elasticity. Mahogany is used largely for propellers in the form of built-up stock of several thicknesses, from which the propeller is carved. White pine, both eastern and western, is used mainly in ribs and webs. Douglas fir is substituted for spruce in beams.

Mahogany is the only propeller wood reported in New York, but black walnut and oak are also desirable material. Experience shows that stock for this use should be quarter-sawn. Propellers or "screws," as they are called, are built up of laminations, each being sawed to size and carefully chosen so as to

SCENE IN THE BLACK FOREST OF WESTERN GERMANY.

What Europeans have accomplished under pressure of necessity can be duplicated by Americans as a measure of sound economics. The Black Forest is a low mountainous region much like the Adirondacks and has the same disadvantages as to accessibility and markets. Yet this forest is managed under the selection system and reproduced by natural methods with profit. New York forests will look like this when New York determines to utilize all her forest land to the best

avoid all defects and to have the grain and density at each end the same. In some plants each lamination is weighed, matched, and balanced against the others, and by this means it is possible to make the blades of the same propeller uniform as to weight, grain, texture, and yielding of the wood under stresses. At the high speeds used, the matter of accurate balance is essential to prevent racking vibrations. The laminations are glued up in a certain temperature and dried for a certain period. By means of a rotary cutter with a guide following a form whose outlines are exactly the same as the screw, the curved surfaces are formed much in the same way as gunstocks. The screw now goes from the outline machine to the duplicator, which turns out the screw with a shape very nearly as desired. The screw is again dried, surfaced, balanced, sanded, and inspected in detail, and is then ready for finishing, which is a careful, detailed series of applications and inspections.

Spruce and ash as reported in 1912 hold the same relative place today; the other woods listed were introduced since the previous study. The average price paid in 1912 was $30.83 while in 1919 it is $230.34. This is the greatest increase in cost seen in any industry, and is the highest average paid by any industry listed.

TABLE 39

AIRPLANES

Kind of Wood	Quantity Used Annually		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	1,427,000	100.00	$230 34	$328,693	105,000	1,322,000
Sitka spruce	1,066,000	74.70	$250 00	$266,500	.....	1,066,000
Ash	109,000	7.64	148 81	16,220	105,000	4,000
Mahogany	100,000	7.01	250 00	25,000	.....	100,000
White pine	74,000	5.19	140 00	10,360	.....	74,000
Western white pine	50,000	3.50	150 00	7,500	.....	50,000
Douglas fir	20,000	1.40	95 00	1,900	.....	20,000
Basswood	5,000	.35	150 10	751	.....	5,000
Port Orford cedar	3,000	.21	154 00	462	.....	3,000

Elevators

Under this head are included passenger and freight elevators and the necessary accompanying parts, such as guides, frames, gates, and platforms. The 1,288,000 feet credited to these uses is less than the actual quantity consumed, because a considerable amount of the material is the product of the planing mill and is listed under that industry. In 1912 the pines contributed about 50 per cent of the total amount used, but this percentage is now much lower. Pitch pine which was reported in by far the largest amount in 1912 was not reported in 1919. Hard maple, which held third place in 1912, is the principal wood now used. This species contributes nearly one-half of the total amount entering the elevator industry and is used principally for elevator floors, guides, and frames. Spruce stands next in amount consumed and has risen from ninth place in 1912 to second place in 1919. This wood also finds use as flooring and framing. Yellow pine occupies the third place of importance, being used to a large extent for guides and frames. Chestnut, hemlock, cypress, and elm are species listed which were not reported in 1912 and those reported in 1912 which do not appear in the accompanying table are pitch pine, red oak, silver maple, birch, and basswood.

The total consumption of wood by the elevator industry is less than half that of 1912, while during the same period there has been only a small reduction in the number of establishments. It is probable that metal has displaced wood to a considerable extent in the industry, which may account for the decrease in wood consumption. There has been a considerable change in the order of importance of the different kinds of wood used since the last report in 1912. This is doubtless owing to the difficulty of securing suitable stock, at a period when manufacturers found it necessary to adapt to their needs the timber which they found available. The average price of raw material has increased from $31.06 to $79.93, which is a relatively greater increase than took place in many other industries during the same period.

TABLE 40

ELEVATORS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	1,288,000	100.00	$79 93	$102,078	160,000	1,128,000
Hard maple	524,000	40.69	$114 39	$59,940	35,000	489,000
Spruce	222,000	17.24	55 00	12,210	.....	222,000
Southern yellow pine	185,000	14.36	50 00	9,250	.....	185,000
Chestnut	68,000	5.27	51 53	3,504	30,000	38,000
White oak	63,000	4.89	66 66	4,200	50,000	13,000
Hemlock	50,000	3.89	41 00	2,050	.....	50,000
Cypress	40,000	3.11	65 00	2,600	.....	40,000
Loblolly pine	38,000	2.96	49 00	1,826	.....	38,000
White pine	32,000	2.48	45 00	1,440	15,000	17,000
Elm	30,000	2.32	30 00	900	30,000	.....
Ash	26,000	2.02	125 30	3,258	.....	26,000
Yellow poplar	10,000	.77	90 00	900	.....	10,000

CLOCKS

New York is one of the most important States in respect to the amount of wood consumed for clocks, although the total amount of wood used for this purpose is not large when compared with other industries. Connecticut probably holds first place in the clock industry. During the past several years the substitution of wood for metal and marble in clocks has become quite popular. Clock cases with a variety of decorations, such as leaves, flowers, scrolls, and other figures require a high class of cabinet work. Ease in working and attractive appearance are desirable qualities for woods used for this purpose. Table 41 includes clock cases only, and not shipping cases as in the report of 1912, when nearly a million feet for the latter purpose was included.

Black walnut, cherry, mahogany, gum, and birch are used mainly for the decorative parts of the cases. Birch is especially valued for turned pieces. Oak is used largely for exterior work which may be given a natural finish or darkened by fuming or stains to produce a mission finish. Yellow

poplar, which heads the list, was not reported at all in 1912. This wood is used for backs and bottoms of cases, because it holds its shape well and is easy to nail and work. Yellow poplar is also much used for enamel work. White pine, the second wood in quantity used, is also employed for enamel-finished clocks. The bottoms of clocks are generally of high-grade white pine, because the softwood bottom improves the tone of the striker which is fastened to the bottom part.

This industry like many others has shown a decided falling off, the amount used for cases being less than one-third the amount used in 1912, although the same number of firms reported. Loblolly pine, red oak, basswood and beech which were used in 1912 are not now reported, while yellow poplar, which was not reported in 1912, now holds first place in importance. The average price paid in 1912 was $31.93 and in 1919 $82.17, a very decided increase. Only 8,000 feet of material is reported as grown in New York, while in 1912 the home-grown wood amounted to 171,227 board feet. Mahogany is the most expensive wood reported at $250 a thousand board feet.

TABLE 41

CLOCKS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	896,000	100.00	$82 17	$73,625	8,000	888,000
Yellow poplar	354,000	39.50	$94 93	$33,605	.....	354,000
White pine	250,000	27.91	58 00	14,500	.....	250,000
White oak	200,000	22.33	80 00	16,000	.....	200,000
Birch	40,000	4.46	90 00	3,600	.....	40,000
Red gum	20,000	2.24	90 00	1,800	.....	20,000
Black walnut	20,000	2.24	140 00	2,800	.....	20,000
Cherry (black)	8,000	.88	40 00	320	8,000	.....
Mahogany	4,000	.44	250 00	1,000	.....	4,000

Sporting and Athletic Goods

Eight firms have reported their activities as manufacturers of sporting and athletic goods. The articles manufactured are bowling-pins, dumb-bells, skiis, billiard tables, and cues. The study in 1912 included wood used for bowling alleys, but in the present report this material is mainly included with millwork.

The woods used for billiard cues are maple, walnut, hickory and mahogany. Billiard tables are made up of chestnut and poplar frames, with oak tops and ash rails. Ash is used largely in the making of skiis. Maple, because of its hardness, close grain, strength, toughness, and ease in turning, is used largely for bowling pins. Experiments are being made by the Forest Products Laboratory in the use of bowling pins of laminated construction.

Athletic goods, as reported, require but a small number of woods for their manufacture. Special qualities are necessary, however, to meet the requirements of these products. In 1912 the study listed twenty-one woods used in this industry. In 1919 but ten were reported, and the total quantity dropped from 4,230,100 feet to 429,000 feet, while the number of manufacturers reporting decreased from twenty to eight. Hard maple, as in 1912, still holds first place; and birch, which is now second, was not included in the earlier report. White oak which formerly held second place is now eighth, and shortleaf pine and red oak which were formerly used in considerable amounts are not now included. All of the woods now reported are native except mahogany. The species not native to New York State, as reported in 1912, were shortleaf pine, lignum-vitae, ebony, mahogany, Circassian walnut, rosewood, long-leaf pine, and teak. The average price now is $74.62, while in the former report it was $61.04. The increase in cost would have been greater had it not been for the reduction in use of the more expensive imported woods. Stock used in this industry generally ranges from 1 inch to 4 inches in thickness.

TABLE 42

SPORTING AND ATHLETIC GOODS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	429,000	100.00	$74 62	$32,010	212,000	217,000
Hard maple	304,000	70.86	$66 43	$20,195	166,000	138,000
Birch	30,000	6.99	30 00	900	15,000	15,000
Yellow poplar	30,000	6.99	150 00	4,500	.....	30,000
Ash	25,000	5.82	60 00	1,500	25,000	.....
Black walnut	10,000	2.34	90 00	900	.....	10,000
Mahogany	10,000	2.34	100 00	1,000	.....	10,000
Chestnut	6,000	1.39	90 00	540	2,000	4,000
White oak	5,000	1.17	175 00	875	.....	5,000
Hickory	5,000	1.17	160 00	800	.....	5,000
Spruce	4,000	.93	200 00	800	4,000	.....

DOWELS AND SKEWERS

Dowels are small wooden pins or rods, usually circular in cross section, used to connect pieces of wood by being sunk in the edges of each to keep them permanently in their proper relative position. They are made of many diameters and various lengths and generally used by chair and furniture makers and door and sash manufacturers. The major portion of this product goes into the manufacture of chairs, but the tops of tables and counters and parts of doors are joined edge to edge by the employment of these dowels or pegs. This method of joining parts is older than the use of iron and copper. The art of manufacturing wooden pins was highly developed many centuries ago. A striking modern instance of the use of dowels is seen in the great Tabernacle of the Latter Day Saints at Salt Lake City, Utah, which structure, including the very extensive arched roof, is stated by the Mormons to have been built, after the plan of Solomon's Temple, without the use of metal fasteners. The product today is no more finished than in ancient times, but the introduction of modern machinery has made it possible for one unskilled man in charge of a machine to produce more pins than a large force of skilled workmen who cut them by hand. Dowels are made in long rods and then re-cut to suit the exact use to which they are to be put. Some-

times they are threaded to hold like screws, but instead of being turned into the wood they are driven in like pegs, the threads giving a better hold upon the sides of the auger holes. New York State is an important producer of cooperage stock, and dowels naturally assume importance as an allied trade. Some minor industries, such as the production of shipping crates and poultry-coops, are also important in the State and consume much of the dowel stock. Some shipping crates are made wholly of these small rods and give great strength to the crate. It is estimated that a good coop or crate made of birch rods is approximately twice as strong and only half as heavy as the small lumber formerly used. Chairs, cribs, and small beds consume much dowel stock.

Skewers are pointed wooden pins or rods similar to dowels, used by the meat trade to hold meat to a spit or for keeping it in form while roasting. The manufacture of skewers, like dowels, is a machine operation. Thin boards are fed into the machine and the skewers come out at the other end.

Dowels and skewers must be of hardwood and all of that used in 1919 came from within the State. Beech, birch, maple, ash, and basswood all furnish suitable material. These species are so readily obtainable that the cost of dowel stock was low, the average price being $55.94. The price in 1912 was $34.38. The quantity reported has decreased over 50 per cent and the number of firms reporting diminished in about the same ratio. Metal skewers are now used in large quantities.

TABLE 43

DOWELS AND SKEWERS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	377,000	100.00	$55 94	$21,080	377,000	.....
Ash	200,000	53.05	$70 00	$14,000	200,000	.....
Hard maple	67,000	17.77	40 00	2,680	67,000	.....
Birch	65,000	17.24	40 00	2,600	65,000	.....
Beech	45,000	11.94	40 00	1,800	45,000	.....

Firearms

Black walnut is the only wood reported for the production of gunstocks, with the exception of 2,000 feet of Circassian walnut. The selection of the most suitable gunstock wood has been carefully considered, and American black walnut has always been given preference for arms of the ordinary grade. For high-grade shotguns and rifles the beautiful Circassian and Italian walnut is imported. Black walnut is easily worked, moderately heavy, polishes well, and has a pleasing appearance. The rough blanks are first rough-sawed from thick lumber and the ends painted to prevent checking. The blanks are then shipped to the factory where they are seasoned in dry kilns. A large number of operations are required to produce the finished stock, including, in addition to these preliminary steps, shaping edges for guide surfaces, routing and chambering, cutting of recesses for attaching the butt swivel-plates, routing out the space for the magazine, trigger guards, or tangs, and the final staining, hard finishing, polishing and dipping in linseed oil. They are then ready for the assembling room. The turning of the curved surfaces of stocks is accomplished by the most ingenious automatic machinery.

Black walnut for gunstocks generally comes from the woodlot areas of the Central West, the original heavy stands having long since been cut over for furniture for which the demand has been very large. The main walnut supply is now located in Missouri, Illinois, Kentucky, Ohio, Iowa, Tennessee, and West Virginia. Sapwood is now used as well as heartwood for most rifle stocks, and staining gives it a uniform color. It will serve the purpose, but is not nearly as satisfactory in feel and appearance as the denser heartwood. In the old Missouri muzzle-loaders curly maple was sometimes used.

Yellow birch and red gum are also used for gunstocks but are not reported in New York State. The difficulty in using birch is that it is hard to find a satisfactory method of staining the stock a walnut color which will penetrate and not wear off. Experimentation has been made upon laminated construction for use in military stocks, which are subject to heavy strain both from recoil and during use of the bayonet.

Establishments making sporting firearms receive their wood as plank or in rough-sawn blank stocks approximately 2 inches thick, 6 inches wide and 18 inches long. When the stock is bought in blank form, it is paid for on a piece basis and not according to the thousand board feet. Military stocks, which include the fore-end, are about 3 feet 10 inches long and require much larger stock in order to secure satisfactory blanks. It would seem feasible to construct all rifles with separate butt-stock and fore-end, since one of the British military rifles was built on this plan; yet the general preference of ordnance experts is apparently for the long one-piece stock. The change to the use of short stocks would permit the utilization of a large amount of material which otherwise could not meet the specifications.

The number of reporting firms is greater than in 1912, but the quantity of wood reported is 30 per cent smaller. The price of $147.78 is an increase roughly proportional to that noted in the other industries.

TABLE 44

FIREARMS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total.....	258,000	100.00	$147 78	$381 30	.....	258,000
Black walnut.....	256,000	99.22	$145 31	$37,210	.....	256,000
Circassian walnut...	2,000	.78	460 00	920	.....	2,000

WHIPS AND UMBRELLA STICKS

A large proportion of the wood listed in the table is used in making umbrella handles and a small amount goes into whip butts. In 1912 2,237,000 board feet of material were used for these purposes. The present figures show a decided decrease, although one more firm is listed than in 1912. Beech furnished over 90 per cent of the wood material in the former

report but is now superseded by birch and maple, which contributed equal quantities. Several woods given in the 1912 table do not now appear, including hickory, ash, basswood, walnut oak, mahogany, ebony, and red cedar. Many of these woods are now much higher in price than the average cost given for those in the table. Rattan and reed used in the whip industry are bought by weight and are not included in this table. The price for this material ranged from 14 to 32 cents per pound, while the hardwoods listed cost $50 per thousand.

Statistics for canes were included with whips and umbrella sticks in the 1912 study, but no wood was reported for this use in 1919.

TABLE 45

WHIPS AND UMBRELLA STICKS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	250,000	100.00	$50 00	$12,500	250,000	.....
Birch	100,000	40.00	$50 00	$5,000	100,000	.....
Hard maple	100,000	40.00	50 00	5,000	100,000	.....
Beech	50,000	20.00	50 00	2,500	50,000	.....

Wood bought by weight — Rattan.

PRINTING MATERIAL

This industry is relatively unimportant, largely because the wood is in the form of small pieces and for small articles. Black cherry is the most important wood, as it also was in 1912, but yellow pine, birch, beech, and hickory, which were reported in 1912, were not reported this time. The articles included in this industry are printers' supplies, wood type, bases for mounting cuts, electrotype blocks, engraving boards, engraving blocks, and printing-press attachments. The essentials of woods for bases of electrotypes and cuts include the qualities of being hard, free from warping, and capable of

holding nails without splitting. There has been a pronounced decrease in the amount of material consumed since 1912, although the number of reporting firms is the same. This industry, though small, offers a good opportunity for the utilization of small and otherwise waste pieces of lumber. Blocks of the more expensive woods, such as cherry and hard maple, can sometimes be worked out of stock which has been discarded by another factory.

TABLE 46

PRINTING MATERIAL

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	own out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	72,000	100.00	$87 29	$6,285	48,000	24,000
Cherry (black)	21,000	29.16	$140 00	$2,940	14,000	7,000
Chestnut	15,000	20.84	40 00	600	15,000	.....
Basswood	15,000	20.84	35 00	525	15,000	.....
White oak	10,000	13.88	75 00	750	.....	10,000
Hard maple	5,000	6.95	230 00	1,150	.....	5,000
Yellow poplar	4,000	5.55	35 00	140	4,000	.....
Mahogany	2,000	2.78	90 00	180	.....	2,000

MISCELLANEOUS

The miscellaneous table includes the reports from a number of minor industries in which the annual consumption of wood is too small to justify the publication of separate tables. It also includes larger industries, some of which are of much importance in the State, but the number of firms engaged is so small that the publication of their figures separately would reveal the identity of those making the report. These data include the manufacture of playground equipment, signs and supplies, florists' sticks, bottle stoppers, artificial limbs, hinges, mouse traps, butchers' supplies, mop wringers, cores, plugs, and reels. (See paragraph 2, Electrical Machinery and Appa-

ratus.) The 1912 report included playground equipment in a separate table as well as signs and supplies, but owing to the small number of firms reporting for 1919 these two tables are now included under the miscellaneous heading in order that the reports may be kept confidential.

The report of 1912 shows a total consumption of 30,790,300 feet reported by 24 firms; in this report 3,708,000 feet are reported by 18 establishments. This marked decrease in consumption is due in part to the smaller number of firms reporting and to the exclusion of dynamite made of wood-flour and fibre-board made of spruce, both of which were included in the former report. These industries are now included in census reports. Matches, formerly included in the miscellaneous table, are now tabulated separately, which makes a difference of over 14,000,000 feet.

White pine still holds first place in the miscellaneous table with 785,000 board feet purchased at a cost of $156.27, a price which indicates that a good grade of material was used. This is a marked increase over $32.80 in 1912. Hard maple is the second wood of importance; this wood was in ninth place in the former report at $30.04 a thousand and now is $33.76, which is a surprisingly small increase. The reason for this small increase probably is that formerly it was all brought in from outside the State, but now it is all State-grown, coming largely from small timber tracts. Beech is now in third place instead of sixth as formerly; in this case also a much larger proportion of the material was home-grown with only a slight increase in price.

The woods used principally for florists' sticks and plant supports are beech, birch, maple, and chestnut. Cork is received in rough form from Portugal and is 2 to 3 inches thick. It is used principally for bottle stoppers; and the waste goes into composition material, such as floor coverings, and is used also for refrigeration purposes. Willow is utilized almost exclusively in the manufacture of artificial limbs. The principal requisites of wood for this use are freedom from check-

ing and warping under varying moisture conditions. The manufacture of artificial limbs requires a long period of drying, as thick stock is necessary for this use and the drying must be sufficiently gradual to prevent checking of the wood in the round. The manufacture of artificial limbs is practically all hand work and each part must be made to measure. Quite a large amount of material is reported as being used in the bung trade, and yellow poplar and spruce are the favorite woods in this industry. Beech and basswood are the main woods contributing to the mouse trap industry. Spruce, ash, and maple are used for butchers' supplies, and the hard maple goes mainly into built-up butchers' blocks, because of its white, clean appearance and its hardness, toughness, and fine grain. Adirondack birch and maple contribute largely to the mop-wringer industry. Beech, birch, maple, elm, and basswood are used in about equal amounts for the manufacture of reels for wire used in conduits. Beech, birch, maple, and elm are utilized largely for cores and plugs used in the paper industry. Signs and supplies draw upon sycamore, tupelo, and red gum; and playground equipment requires yellow poplar, white pine, Douglas fir, ash, and basswood.

The average cost of material listed in this table is now $72.32, as compared with $29.80 in 1912; and the three notable increases are in white pine, yellow poplar, and ash. It is encouraging to note that the beech, birch, and maple, the staple hardwoods of New York, were nearly all obtained within the State. On the other hand there is food for serious reflection in the fact that in New York, once the home of the white pine, it was necessary to import every foot of the 740,000 feet consumed. Is not something seriously wrong with our economic planning?

TABLE 47

MISCELLANEOUS

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per 1,000 feet	Total cost f. o. b. factory	Grown in New York. (Feet b. m.)	Grown out of New York. (Feet b. m.)
	Feet b. m.	Per cent				
Total	3,708,000	100.00	$72 32	$268,153	1,652,000	2,056,000
White pine	785,000	21.16	$156 27	$122,675	.....	785,000
Hard maple	603,000	16.25	33 76	20,357	603,000	.....
Beech	460,000	12.40	30 80	14,168	434,000	26,000
Birch	362,000	9.76	33 20	12,018	362,000	.....
Sycamore	300,000	8.09	48 00	14,400	.....	300,000
Tupelo	250,000	6.74	45 00	11,250	.....	250,000
Yellow poplar	240,000	6.47	135 62	32,550	.....	240,000
Spruce	225,000	6.07	60 00	13,500	150,000	75,000
Southern yellow pine	160,000	4.32	48 00	7,680	.....	160,000
Red gum	150,000	4.05	45 00	6,750	.....	150,000
Elm	51,000	1.38	25 10	1,280	51,000	.....
Basswood	48,000	1.30	32 60	1,565	41,000	7,000
Ash	48,000	1.30	172 29	8,270	8,000	40,000
Douglas fir	20,000	.54	65 00	1,300	.....	20,000
Willow	3,000	.08	40 00	120	3,000	.....
Southern red cedar	2,000	.06	110 00	220	.....	2,000
Chestnut	1,000	.03	50 00	50	.....	1,000
Cork*	.....	.....	.....	.....	.....	.....

* 300,000 pounds.

APPENDIX

The foregoing tables show what becomes of the lumber after it leaves the sawmill, following the various steps in manufacture until the finished commodities are produced as furniture, toys, handles, etc. There are various other forms of forest products in addition to lumber, and the purpose of the following pages is to give a brief synopsis showing the production of some of these other forms, the data being taken from the latest available sources as indicated.

FOREST PRODUCTS OF NEW YORK

The following tabulations are copied from the 1919 report of the New York State Conservation Commission, showing the production of lumber in 1918 from the principal softwoods and hardwoods. The last table shows the consumption of wood in the production of shingles, lath, heading, staves, posts, poles,

ties, pulpwood, and wood for acid, excelsior, kilns, etc. It includes both lumber and round wood expressed in board feet.

Lumber Production of New York

Table A. 1918

	Feet B. M.
Spruce	25,874,690
Hemlock	75,005,150
Pine	62,653,500
Balsam	1,505,094
Cedar	227,568
Tamarack	91,114
Maple	55,789,225
Beech	37,196,320
Oak	26,895,820
Birch	25,505,900
Chestnut	15,370,950
Basswood	14,533,350
Ash	9,696,750
Elm	7,314,180
Locust	2,085,690
Poplar	1,167,300
Hickory	898,270
Cherry	763,885
Gum	223,165
Sycamore	160,900
Minor species	74,075
	363,132,896

Pieces

Shingles	5,712,000
Lath	4,179,300
Heading	8,296,366
Staves	453,000
Posts	91,462
Poles	19,218

Cordwood

For acid, excelsior, kilns, etc.	225,420 Cords

Forest Products by Years

1908	1,226,754,365
1909	1,091,164,710
1910	927,933,291
1911	972,596,685
1912	942,545,269
1913	851,391,367
1914	855,658,389
1915	804,142,388
1916	863,932,860
1917	861,870,781
1918	762,289,934

With regard to lumber, as recorded by the Forest Service in 1918, New York does not occupy the lead in the production of any single species, but has third place in the production of birch, fourth in maple and basswood, fifth in beech, sixth in ash and hemlock, seventh in balsam fir, eighth in white pine, spruce, and chestnut, and ninth in elm. In 1919 over 1,200 sawmills were in operation.

Pulpwood Consumption

The pulp industry in New York is enormously important. In 1918 New York consumed 1,003,742 cords of pulpwood, one-half of which was imported from Canada or other States. The only State consuming more pulpwood is Maine, which used 1,234,929 cords. New York, however, has over twice as many mills as Maine, and probably the greater capitalization. The ever-increasing demand for pulpwood is one of the important factors which must be reckoned with in planning the future forest policy of the State. The pulp mills utilize small and inferior trees as well as those which are large and mature, but in certain species the pulp mills compete with the sawmills as to which shall obtain and manufacture the wood. For instance, in 1912 the secondary wood-using industries used 76,000,000 feet of home-grown spruce and in 1919 only 20,000,000 feet. This very appreciable decrease in seven years is no doubt due in part to the consumption of this valuable tree for pulpwood. The industries of the State are still using large quantities of spruce, but much of it is now necessarily imported. Spruce once occupied a distinctly inferior position to white pine in the estimation of lumbermen, but the excellence of spruce fibre for pulp purposes has now made it very valuable.

In these days the pulpwood is often transported from distances of 500 miles or more, the supplies near the mills having been exhausted in previous years. It is reported that 60 per cent of the New York mills have no supplies of their own, but must depend upon purchase, largely from sources outside the State. Canada has always been the main reliance for imported spruce, but since 1910 several Canadian Provinces have found it desirable to forbid the export of pulpwood cut from their

Crown lands. Sixty per cent of the remaining spruce pulpwood in New York is on the State Preserves, where no cutting is allowed.

Pulpwood Consumption in New York

Year	Mills	Wood consumed, (cords)	Total cost, (dollars)	Pulp produced, (tons)
1909	90	921,882	9,630,575	686,323
1916	75	1,094,513	12,098,608	787,397
1917	79	1,056,556	15,270,142	798,616
1918	75	1,003,742	17,954,934	749,176

The amount of pulpwood produced annually by the State is now utterly insufficient to supply the mills, as indicated by the following statistics of the Conservation Commission for 1918, being less than 50 per cent of the annual consumption.

Species	*Cords*
Spruce	335,423
Balsam	54,460
Hemlock	85,054
Poplar	22,925
Basswood	3,780
	501,642

Like the secondary industries, the wood-pulp manufacturers are already restricted in their operations for the lack of raw material. Some firms are moving to other regions where a greater supply of pulpwood is in sight. The last great areas of forest remaining are in Washington, Oregon, and Alaska. Apparently New York must eventually lose to the other States a large part of this great industry, with all the laborers, wages, and wealth production incident to such loss. The only way to win back this source of prosperity is through reforestation on a large scale. Many years will be required to increase the annual supply to its maximum, and the New York mills can always handle any amount which the forests of the State could conceivably produce. Therefore the market for pulpwood will always be active and its production profitable upon the farm woodlots or on larger forest tracts.

A Pulp and Paper Mill in Northern New York.

The great mills of this type consume enormous quantities of wood. No forest is inexhaustible to them and the large modern sawmills. New York is now unable to produce half the pulpwood needed for her mills. It is therefore [illegible]

Slack Cooperage

In 1918 New York produced 33,853,000 slack staves, about 3 per cent of the production of the United States. Nearly 3 per cent of the total slack heading also comes from New York. In slack cooperage the State ranks in the eighth place.

The three principal hardwoods of New York, namely, birch, maple, and beech are the important slack-cooperage species of the State in the order mentioned. Most of the cooperage is made by a few large cooperage plants. However, there are a considerable number of small firms which manufacture an appreciable quantity of cooperage. These small shops are located principally in central and western New York. New York receives a great deal of cooperage in the form of hoops, heading, and staves from outside sources and this material is assembled in a large number of shops throughout the State. The larger portion of the slack cooperage is used in the marketing of agricultural and horticultural products. The introduction of cotton, jute, and paper bags, and various cardboard containers reduced the former demand for slack cooperage to a considerable extent. Flour, formerly sold almost entirely in barrels, is now marketed mainly in paper bags which cost much less.

Woods which dry quickly, steam well, retain their form when bent, and are comparatively free from resin and odor make the best stave material. Care in cutting the stave bolts into the right sizes (quarters, fifths, or sixths, as the bolting-saw operator sees fit) means the reduction of waste and the production of better staves. Judgment and care in the handling of the bolts under the stave cutting knife are also necessary to avoid losses of raw material or the production of inferior work.

Elm is the principal hoop stock, its superior tensile strength recommending it above all others. Coiled elm hoops are made by slicing or sawing, the former methods being less wasteful because there is not even the loss of saw kerf. Most barrel hoops, however, are sawed, and are generally between 1 and 2

inches wide, 3/16 of an inch thick on the thick edge, 1/16 of an inch thick on the thin edge, and range from 4 to 7 feet in length.

Tight cooperage is unimportant in New York, the principal centers of that industry being in Arkansas, Mississippi, Tennessee, Alabama, Louisiana, Missouri, Kentucky, and the Pacific States.

Veneers

The raw material which goes into the veneer plant is in the form of logs. There are three processes of manufacturing. In one process the logs are cut into square blocks called flitches, and then passed through the usual process of sawed lumber, except that a special equipment is required for producing very thin lumber, whereby guide ways are used to hold the very thin boards upright and in proper position while the saw passes very slowly along the side of the log.

Another process is that of slicing, wherein the log is thoroughly steamed, squared, and then dropped against a sharp knife extending the full length of the log.

The third process is called "rotary cut" which is similar to the slicing method except that the log is prepared in round form, and after being steamed is revolved rapidly against a fixed knife, which peels off a thin, continuous sheet. This latter process is the most economical, requires less skill, and is in more general use than the others.

Veneers are cut into many thicknesses from 5/16 to 1/120 of an inch. The domestic rotary cut woods range from 1/50 to 5/16 of an inch in thickness. The imported woods are cut mostly from 3/16 to 1/34 of an inch. The mahogany veneers are cut mostly to 1/28 of an inch with a good proportion of 3/16 of an inch. The extremely thin mahogany veneers find such uses as tobacco-can linings and coverings.

The growing tendency to market many commodities, such as fruits and vegetables, in light-weight packages has opened a wide field for thin lumber and the future promises extensive

growth. Large quantities of the Adirondack rotary veneers are made into wire-end dishes for containing butter, lard, pickles, etc.

Built-up lumber, consisting of several layers firmly glued together with the grain crossed, is becoming more important every year in many industries. Furniture tops, panels and backs, drawer fronts and bottoms, chair seats, trunks, store and office fixtures, pianos, packing boxes, vehicle and automobile bodies, and the finish of passenger cars are examples of the product of veneer and built-up lumber. The built-up lumber, or plywood, has the advantage of being much stiffer and stronger than solid lumber for the same weight, and is also less liable to warp or check. In the shipment of fruit and vegetables, where strength is unimportant and lightness is essential, the introduction of rotary-cut veneer lumber has made possible the utilization of many comparatively inferior species, and the same cheaper woods are used as cores in connection with the high-grade sliced and sawed veneers in the manufacture of furniture and fixtures. Species such as cottonwood were considered of little value owing to the tendency to warp, until utilized in the form of veneers. In built-up lumber they may be used for the middle layer with other woods for the external layers.

In the United States red gum is the principal veneer wood, but many other species are used. Mahogany, Circassian walnut, and English oak are the imported species in greatest demand, while gum, hard maple (especially the rich figured wood) and white oak, are among the most popular domestic finishing woods.

With the exception of Spanish cedar, which generally goes into cigar boxes, the foreign woods are mostly used for the best grades of cabinet work, furniture, and fixtures.

In 1911 New York led in the veneer industry. Although there are no recent reports from other States showing veneer production, it is believed that New York still stands well toward the head of the list as regards the quantity produced.

Wood Distillation

Valuable commercial products are obtained through wood distillation by two distinct processes, destructive distillation and steam distillation. In the former process the wood fiber is broken down and charred and new compounds are formed, while in the steam process the wood retains its original form. In destructive distillation direct heat is applied below the vessel containing the wood and the heat vaporizes the volatile compounds, such as turpentine, and breaks down the non-volatile compounds, such as wood gums, and forms a number of new compounds, leaving a residue of charcoal. The decomposition of wood in this process is complicated and not yet fully understood.

In obtaining the products from steam distillation the process is simpler. The wood is chipped and placed in a closed receptacle into which steam is blown from a boiler, and the volatile compounds are vaporized and carried out of the retort with the steam. Although the wood is at times so much overheated that its fiber is slightly decomposed, it is substantially correct to say that in steam distillation there is no decomposition of the wood fiber, while in the destructive distillation the fiber is destroyed. In the one process the wood is only steamed, while in the other the wood is charred or burned.

As there are two different processes of obtaining distillates, so there are two different classes of products obtainable from the various woods. The hardwoods, for example, such as beech, birch, and maple, yield acetic acid, wood alcohol and charcoal; while the softwoods, such as longleaf pine, yield turpentine, tar, oils and charcoal. This difference in the products is due to the fact that pine woods are resinous, while hardwoods are non-resinous.

New York is not within the softwood distillation area. Hardwood distillation plants are found principally in New York, Pennsylvania, and Michigan, where an adequate supply of beech, birch, and maple is available. These three woods produce nearly all of the commercial products. The Forest

Service has conducted experiments to determine the comparative value, not only of birch, beech, and maple, but also of red gum, oak, hickory, chestnut, and tupelo gum, for their distillation products. In New York the oak and hickory may ultimately be utilized profitably, but the distillation of chestnut is not at present a success on account of its low yields of the desired products.

The distillation plants demand wood which is allowed to season for a year in five-foot cordwood length. The products obtained have a variety of uses. The charcoal is used in blast furnaces for the production of pig iron, in copper and sugar refineries, in the production of gunpowder, and as fuel. Wood alcohol is sold under a variety of trade names, and most widely used as a solvent in the production of shellacs and varnishes. Acetic acid is used in the manufacture of wood vinegar. The calcium acetate resulting from the action of acetic acid on milk of lime ($Ca(OH)_2$) is the basis of many commercial acetates. Both ethyl alcohol (C_2H_5OH) and methyl alcohol (CH_3OH) are commercially produced from wood. Denatured alcohol, with its admixture of wood alcohol, has become a market article of high importance. Distillation is comparatively a new utilization of forest products in the United States, and the business is growing rapidly. Owners of farm woodlots having an abundance of the principal species needed for hardwood distillation, including beech, birch, and maple, should obtain substantial benefits by the further growth of this industry; but the practice of allowing distillation operators to strip woodlots of all valuable young growing stock, which has been too common in some southern counties, should be discouraged as far as possible. It is a short-sighted policy, both for the owner and the welfare of the State.

Excelsior

In New York, as elsewhere, cottonwood is the favorite excelsior wood. Any soft wood that has a fairly long or tough fibre will make excelsior. Several woods, among them being

chestnut, are soft enough and have the quality of workableness, but are not suitable for excelsior because they become too brittle after drying. Many kinds of wood are used in the United States, including in addition to those listed in New York, yellow poplar, birch, maple, white ash, cherry, yellow pine, white pine, tamarack, cypress, hemlock, black gum, and red gum. New York has a great abundance of raw material suitable for excelsior, especially of that ideal excelsior material, cottonwood. This industry is supplied almost entirely from timber grown in New York, and the average cost of the raw material quoted in 1919 was $12.85. Basswood is even better than cottonwood, but it is not so generally available at local points. All cottonwood does not make good excelsior but many species are excellent. The stock must be free from knots, but use may be made of small timber and of short lengths, and thus utilization can be had of much material that is not fit for the sawmill. There is not much timber left on an acre where the excelsior machines have taken all they can use. The utilization is close in the factory also and everything is salable, even the roughest product being sold to liverymen for stable bedding or to nurserymen for shipping young trees. Some thickened slabs in the mill can be worked, but other mill waste, such as strips and shavings, cannot be converted into excelsior because the process involves shaving the wood into strings from the face of the block. The logs for excelsior must be perfectly dry. They should be seasoned for six months or more and then cut into blocks and quartered. The blocks are fastened into the machines and automatically fed. A series of sharp spurs, generally set less than an inch apart are forced along the surface of the block, cutting grooves to a depth less than the thickness of a match. A knife follows these spurs, cutting loose the scorings made by them and causing a bunch of curly excelsion fibres to fall from the block. The machines may be regulated to cut coarse strands or fine. The finest grades are called wood-wool. Excelsior is readily colored by aniline dyes for ornamental uses.

Besides constant use in general packing, excelsior is in demand by upholsterers of furniture and by manufacturers of

carriages, mattresses, and chairs. It is also used extensively for shaping dolls and toy animals. Mattress factories use a great deal of excelsior for the centers of low-grade mattresses, which are then faced with quilted cotton.

The excelsior industry, like the newsprint industry, gives the closest utilization of raw material placed at the door of the factory. The armies of the world used excelsior for filling mattresses; the manufacturers of china and glass not only protect shipments from breakage but avoid dampness which formerly existed when straw and hay were used. Wood-wool has only one-third the weight of hay, and is crowding the older packing material out of the markets through its lightness of weight, cleanness, and assortable condition for packing. Kennel and stable bedding, filtering mediums for beer, packing fancy goods, ornamenting shop windows, and innumerable other uses requiring elastic, pliable, clean, and bright packing material all invite the establishment of excelsior plants in the several woodlot areas of the State of New York.

EXCELSIOR

KIND OF WOOD	QUANTITY USED ANNUALLY		Average cost per cord	Total cost f. o. b. factory	Grown in New York, cords	Grown out of New York, cords
	Cords	Per cent				
Total	14,380	100.00	$12 85	$184.728	12,910	1,470
Cottonwood	9,105	63.32	$12 80	$116,544	8,200	905
Basswood	5,075	35.29	13 12	66,584	4,510	565
Butternut	200	1.39	8 00	1,600	200	.....

RELATIVE UTILITY OF SPECIES.

A merely superficial knowledge of the industries would be sufficient to rate white pine at once as the most useful wood in New York State. It would not be so easy, however, to place many of the other species in the relative order of their usefulness, unless some method of rating were adopted.

Usefulness depends first upon those qualities which the wood possesses which render it especially fit to perform service

under exacting conditions. But no matter how distinctive and how numerous the qualifications might be, if the wood were so scarce or so costly as to be unobtainable or nearly so, it could not be deemed useful in a broad sense of the word. Therefore, the rating must depend not only upon the capacity to perform service, but the physical presence or availability of the species. For example, hickory and black walnut have qualifications which rendered them exceedingly useful so long as they were obtainable in quantity; but now that they are scarce and difficult to obtain, their use, and consequently their usefulness, has greatly diminished.

The following classification is based upon both these principles. The number of articles made from each species was counted and adopted as the index of its qualities. This number was then multiplied by the per cent of the wood consumption of the State supplied by that species. The products of these multiplications were then arranged in order of size, giving the following list in order of usefulness:

Approximate Relative Utility of Species

Species	*Rating factor*	*Species*	*Rating factor*
1. White pine	17.5	11. Cypress	1.5
2. Hard maple	7.4	12. Ash	1.3
3. Spruce	6.7	13. Red gum	1.2
4. Birch	3.5	14. Hemlock	.8
5. White oak	3.0	15. Chestnut	.6
6. Southern yellow pine	2.7	16. Mahogany	.3
7. Basswood	2.3	17. Douglas fir	.3
8. Loblolly pine	1.8	18. Elm	.2
9. Beech	1.7	19. Red oak	.1
10. Yellow poplar	1.7	20. Black walnut	.1

No doubt this list is subject to criticism in some respects. Usefulness is a quality which can not be precisely rated by mathematics or conventional means, especially where it is impossible to take cognizance of all the facts which should have a part in the conclusion. Yet in the lack of a better, the list above will serve as a fairly reliable guide in appraising the service performed by these species. Out of the twenty species listed, thirteen, including the first five, are the natural product of New York's splendid forest soils.

Kinds of Wood Used by the Industries

Applewood

Handles
Handles, saw

Arborvitae (*Northern white cedar*)

Boat bottoms
Boat decking
Furniture
General millwork
Planing mill products
Roof tanks
Row boats
Shiplap
Siding
Signal devices
Woodenware
Yachts

Ash

Aeroplanes
Agricultural implements
Automobiles
Baskets
Bodies
Bolsters
Bows, auto-tops
Boxes
Box springs
Brush backs
Buggies
Butcher fixtures
Butter packages
Butter tubs
Cabinets
Candy pails
Car construction
Carts
Caskets
Chairs
Cheese boxes
Coal screen frames
Crates
Curtain poles
Desks
Dowels
Dumb-waiters
Elevators
Finish
Fixtures, store, office
Furniture
Handles
Hand rakes
Hoops
Interior trim
Ladders, round
Machinery, frames
Machinery, rods
Motor vehicles
Musical instruments
Novelties
Organs, frames
Panels
Patterns
Picture frames
Playground equipment
Plow beams
Plumbers' woodwork
Plywood
Poles, vehicle
Pump rods
Refrigerators
Rollers, farm machinery
Scientific instruments
Ships
Singletrees
Skiis
Skids
Sleds
Sleighs
Snow shovel handles
Sofas
Souvenirs
Stakes, wagon
Stanchions
Steering wheels
Threshers
Toilet tanks
Toilet seats
Tongues
Toys
Tripods
Trunk slats
Trunk strips
Turnery
Wagon poles
Wagon, coasters
Whiffletrees
Woodenware

Balm of Gilead

Boxes
Crates
Packing

Balsawood

Boat equipments
Life preservers
Refrigeration, cars
Refrigeration, ships
Refrigeration, trucks

Balsam Fir

Boxes
Cheese box heads
Crates
Dairy supplies
Planing mill products

Basswood

Aeroplanes
Agricultural implements
Automobiles
Baby carriages
Bank fixtures
Basket covers
Basket splints
Beehives and bee supplies
Berry baskets
Billiard-table beds
Boats
Bookcases
Boxes, fancy
Brooms
Brushes
Butter tubs
Cable reels
Cameras
Candy buckets
Cars
Car construction
Casing
Caskets
Ceiling
Chairs
Checkers
Cheese box heading
Children sled tops
Cigar boxes
Corn planters
Crates
Dominoes
Drawer bottoms
Drafting furniture
Drills
Dumb-waiters
Egg carriers
Egg cases
Excelsior
Filing cabinets
Fixtures
Furniture
Games
Go-carts
Graders, peach
Grain hoppers
Grass seeders
Handles
Hand sled tops
Hay racks
Hobby horses
Ice tools
Incubators
Indian clubs
Instrument cases
Ladders
Lasts
Lawn furniture
Machine construction
Matches
Milk racks
Molding
Mousetraps
Motor vehicles
Musical instruments
Novelties
Packing boxes
Pails
Panels
Patterns
Pianos
Piano players
Picture frames
Playground equipment
Plywood
Printers' cabinets

Pulleys
Reels, cordage
Rulers
Scientific instruments
Scoops
Shade rollers
Shirt waist boxes
Shoe-trees
Shoe forms
Shop patterns
Showcases
Skids
Sleigh bodies
Spools
Store fixtures
Threshing machines
Toys
Trunks
Turnery
Wagons
Wagon boxes
Wheelbarrows
Window frames
Woodenware
Yardsticks

Beech

Agricultural implements
Automobile seat frames
Baskets
Beater paddles, paper mills
Bobbins
Boxes
Brick molds
Broom handles
Brushes
Built-up panels
Bushel crates
Butchers' blocks
Butter dishes
Cable reels
Camp furniture
Cars
Caskets
Chairs
Chair bottoms
Cheese boxes
Clothespins
Coat hangers
Cores
Crates
Crating
Dowels
Farm machinery
Fixtures
Flower supports
Furniture
Handles
Hat racks
Kodaks
Ladders
Ladles
Lasts
Laundry appliances
Lawn swings
Machine construction
Map rollers
Meat boards
Motor vehicles
Mousetraps
Musical instruments
Novelties
Pails
Panels
Patterns
Pencil boxes
Pianos, backs and bottoms
Pipe organs
Plugs, paper mill
Plumbers' woodwork
Reels, cross
Reels, rope
Refrigerators
Rulers
Sash
Sectional bookcases
Scientific instruments
Showcases
Shuttles
Stanchions
Tables
Toys
Trunks
Umbrella handles
Vehicles
Wardrobes
Washing machines
Wheelbarrows
Whip butts
Window screens
Woodenware
Yardsticks

Birch

Agricultural implements
Automobile rims
Baskets
Boat finish
Bobbins
Bookcases
Bowling pins
Boxes
Brick molds
brush backs
Built-up panels
Butter boxes
Butter molds
Cabinets
Cable reels
Cameras
Camp furniture
Car finish, vestibules
Carts
Casing
Caskets
Ceiling
Chairs
Cheese boxes, hoops
Clocks, turnery parts
Clothespins
Couch frames
Cores
Crates
Crating
Desks
Dowels
Duck pins
Dumb-waiter cars
Fixtures, exterior parts
Flooring
Furniture
Games
Handles, broom, umbrella
Hand sleds
Harvesters
House trim, general
Hubs, wheelbarrow
Hubs, wagon
Interior finish
Ladders
Machine construction
Mantels
Meat boards
Mirror backs
Molding
Mop wringers
Motor vehicles
Musical instruments
Office fixtures
Panels
Parlor furniture
Partitions
Patterns
Peavey handles
Picture frames
Plugs, paper mill
Plumbers' woodwork
Pulleys
Reels, cordage
Refrigerators
Scientific instruments
Scoops
Screen frames
Settees
Shoe-trees
Showcases
Shuttles
Sleds, hand
Sleighs
Sofas
Spools
Store fixtures
Swings
Tables
Thresher parts
Toilet seats
Toilet tanks
Toys
Tripods
Trunks
Wagon bodies
Wheelbarrows
Whip butts
Woodenware

Black Cherry

Baskets
Beds
Boat finish
Bookcases
Boxes
Brick molds
Brushes
Bushel crates
Cabinets
Camera boxes

Cars, finish
Casing
Chairs, posts, rounds
Clock cases
Counters
Desks
Doors
Dressers
Electrotype blocks
Engraving blocks
Fixtures
Flasks
Flooring
Furniture
Handles
Interior finish
Kitchen cabinets
Kodaks
Library furniture
Machine boxes
Molding
Musical instruments
Office fixtures
Panels
Partitions
Patterns
Piano actions
Piano cases
Piano players
Piano rails
Picture frames
Pipe organ, cases, actions
Printing material
Sash
School furniture
Scientific instruments
Scoops
Settees
Spindle stock
Store fixtures
Tables
Table drawers
Table legs
Trim
Typewriter tables
Woodenware

Black Walnut

Billiard cues
Bookcases
Brush backs
Bureaus
Cabinet work
Caskets
Chairs
Chair legs
Chiffoniers
Clock cases
Coffins
Couches, legs
Desks
Doors
Fixtures, exterior parts
Fixtures, office
Fixtures, store
Furniture
Gunstocks
Handles
Interior finish
Miter boxes
Molding
Organ cases
Parquetry flooring
Pianos
Piano benches
Piano cases
Piano players
Picture frames
Plywood
Ship trim
Sideboards
Side tables
Vehicles
Woodenware

Boxwood

Brush backs
Scientific instruments

Buckeye

Boxes
Caskets
Chairs
Fixtures
Furniture
Interior finish
Ladders
Trim
Vehicles
Woodenware

Butternut

Boat decks
Boat finish
Boat seats
Cabinets
Excelsior
Furniture
Instrument cases
Interior finish
Panels
Scientific Instruments

Chestnut

Agricultural implements
Automobiles
Baskets
Billiard tables
Car construction
Caskets
Chairs
Cheese boxes
Coffins
Doors
Dumb-waiters
Elevators
Fixtures
Flooring
Florists' sticks
Incubators
Machine construction
Molding
Musical instruments
Picture frames
Planing mill products
Plywood
Printers' Cabinets
Printing material
Refrigerators
Ships
Toilet seats
Toilet tanks
Toys
Toy wagons
Vehicles
Woodenware

Circassian Walnut

Casing
Doors
Fixtures
Furniture
Furniture, office
Interior finish
Kitchen cabinets
Office fixtures

Cocobola

Brush backs
Cutlery handles, general
Knive handles

Cottonwood

Agricultural implements
Berry boxes
Boxes
Brush backs
Bushel crates
Cheese boxes, heads
Crates
Excelsior
Grape trays
Matches

Cypress (Bald)

Agricultural implements
Baseboards
Blinds
Boat doors
Boat frames
Boat lockers
Boat panels
Boxes
Burial caskets, outer boxes
Cabinets
Cab tops, locomotive
Cameras
Car roofing
Cars
Car siding
Caskets
Cheese vats
Churns
Coffins
Cornices

Doors
Elevators
Exterior finish
Finish
Fixtures
Furniture
Greenhouses
Gun cases
Handles
Interior trim
Launches, sides
Laundry tubs and appliances
Machine construction
Machine walkways
Motor vehicles
Moldings
Musical instruments
Office fixtures
Patterns
Picture frames
Plumbers' woodwork
Pump covers
Refrigerators
Sash
Scientific instruments
Screen frames
Ships, sash, panels
Siding
Signaling devices
Silos
Store fixtures
Store fronts
Tanks
Trim, boat
Vehicles
Washing machines
Window frames
Woodenware

Dogwood

Bobbins
Shuttles

Douglas Fir

Aeroplanes
Agricultural implements
Boat decking
Boat flooring
Boat siding
Boxes
Car construction
Caskets
Ceiling
Derrick poles
Doors
Exterior finish
Fixtures
Interior finish
Ladders
Musical instruments
Piano backs
Playground equipment
Sash
Ship beams
Ship siding
Ship sills
Silos
Spars, ship and boat
Woodenware

Ebony

Brushes
Cutlery, handles
Knife handles

Elm

Agricultural implements
Baskets, bottoms, covers
Boxes
Broom handles
Butter tubs
Bushel crates
Chairs
Cheese boxes, heads, hoops
Cable reels
Crating
Couch frames
Elevators
Fruit cases, handles, hoops
Furniture
Go-devils
Handles
Hayracks
Hub, vehicle
Instruments, musical
Ladders
Lasts
Machine construction
Motor vehicles
Planing mill products

Plugs, paper mill
Plywood
Rockers
Sash
Ships
Sleighs
Stanchions
Trunks, slats
Vehicle poles
Whiffletrees
Woodenware

English Oak

Furniture
Interior finish
Interior trim

Granadilla (*Cocowood*)

Cutlery handles
Knife handles

Hemlock

Agricultural implements
Baskets
Blinds
Boxes
Car construction
Cheese boxes
Crates
Doors
Electrical machinery and apparatus
Elevators
Flasks
Flooring
Fixtures
Furniture
Handles
Machine construction
Patterns
Refrigerators
Ships

Hickory

Agricultural implements
Automobile wheels
Axles
Billiard cues
Boats
Bolsters
Buggies
Buggy shafts
Buggy spokes
Doubletrees
Eveners
Handles, tool
Instruments, tripods
Lasts
Mallets
Motor vehicles
Rakes, hand
Singletrees
Skiis
Sleighs
Spokes
Vehicles
Wagon rims
Wagon tongues

Holly

Brush backs
Musical instruments
Piano actions

Lignum-vitae

Bowling balls
Bushings
Caster wheels
Handles
Mallets
Rollers
Scientific instruments
Woodenware

Loblolly Pine

Agricultural implements
Automobiles
Boxes
Crates
Doors
Elevators
Finish
Fixtures
Furniture
Garden implements

Kitchen cabinets
Ladders
Machine construction
Musical instruments
Packing boxes
Refrigerators
Sash
Ships
Silos
Tanks
Trim
Vehicles
Woodenware

Locust

Brick molds
Flasks
Patterns
Ships, treenails

Mahogany

Aeroplanes
Automobile trim
Beds
Billiard cues
Bookcases
Brushes
Cameras
Car finish
Caskets
Chairs
Clock cases
Engraving blocks
Fixtures, exterior
Furniture
Instrument cases
Instruments, musical
Instruments, scientific
Interior finish
Kitchen cabinets
Lamps
Machinery, electrical, bases
Mantels
Molding
Parquetry
Patterns
Picture frames
Plywood
Printing material
Ships
Smokers' furniture
Vehicles
Woodenware

Maple (hard)

Agricultural implements
Automobile steering wheels
Axletrees
Axles
Baskets
Bedroom furniture
Billiard cues
Billiard tables
Blueprint frames
Boat finish
Bobbins
Bobsleds
Bolsters
Bowling alleys and pins
Boxes
Brick molds
Bridge sticks
Brush backs
Butcher blocks
Butter ladles
Butter molds
Camp furniture
Car finish
Car flooring
Caskets
Ceiling
Chairs
Chair bottoms
Chair rods
Checkers
Cheese boxes
Children's wagons
Clothespins
Coat hangers
Corn planters
Corn shellers
Cot frames
Crates
Curtain poles
Desks
Dishes
Doors
Dominoes
Dowels
Drill frames
Dumb-bells
Dumb-waiters
Dump-wagon boxes

Electrotype blocks
Elevator guides
Eveners
Fixtures
Flasks
Flooring
Furniture
Gears, wagon
Handles:
  cultivator
  broom
  brush
  parasol
  umbrella
Interior finish
Kitchen cabinets
Ladders
Lasts
Laundry appliances
Machine frames
Map rollers
Matches
Meat boards
Milk racks
Mop wringers
Motor vehicles
Molding
Musical instruments
Novelties
Office fixtures
Organs
Paddles, boat
Parquetry flooring
Patterns
Pianos
Piano bottoms
Piano bridges
Piano players
Picture frames
Plugs, paper mill
Plumbers' woodwork, seats and tanks
Plywood
Printing material
Pulleys
Pumps
Pump buckets
R. R. signal boards
Reels, cable
Reels, cordage
Refrigerators
Rollers, caster
Rollers, land
Rollers, road
Rules
Sash
Scientific instruments
Scoops
Shoe forms
Showcases
Skids
Skiis
Sleds, hand
Sleighs
Spools
Sporting goods
Stanchions
Surveying rods
Toys
Toy wagons
Tripods, surveyors'
Turnings
Vehicles
Wagons
Washing machines
Wedges
Wheelbarrows
Whiffletrees
Whip butts
Woodenware
Wood heels
Wood pulleys, split
Wood type
Yardsticks

Maple (Soft)

Baskets
Bassinets
Fixtures
Furniture, drafting
Instruments, musical
Washing machines

Persimmon

Shoe lasts
Shoe lasts, infants

Pitch-Pine

Finish
Trim

Port Orford Cedar

Ships

Rattan

Aeroplanes
Furniture
Whips

Red Cedar

Boats
Caskets, burial
Chests
Fixtures
Furniture
Interior finish
Marine borer plugs
Pencils
Sash
Siding

Red Gum

Agricultural implements
Automobiles
Baskets
Boat finish
Bookcases
Boxes
Cabinets
Cars
Chairs
Clocks
Curtain poles
Desks
Doors
Drawer panels
Dressers
Finish
Fixtures
Furniture
Instrument cases
Instruments, musical
Instruments, professional
Kitchen cabinets
Kodak film spools
Machinery, frames
Mantels
Office fixtures
Pianos, actions
Piano benches
Piano players
Picture frames
Plywood
Signs
Smokers' furniture
Refrigerators
Tables
Threshing machines
Tool chests
Telephone stands
Toys
Vehicles
Weather strips
Wheelbarrows
Wood pulleys

Red Oak

Automobiles
Bows, auto tops
Boxes
Car construction
Caskets
Chairs
Coffins
Interior finish
Fixtures
Flooring
Furniture
Machine construction
Magazine cases
Motor vehicles
Molding
Musical instruments
Refrigerators
Sash
Ships
Toys
Toy wagons

Red Pine

Boxes
Car construction
Ladders
Mill work
Shade rollers

Redwood

Boats
Caskets
Cigar boxes
Coffins
Doors
Flasks
Interior finish
Musical instruments
Patterns
Sash
Shirt waist boxes
Whips, reed

Rosewood

Automobile trim
Brush backs
Fixtures
Fixtures, store
Knife handles
Musical instruments

Sassafras

Novelties
Souvenirs
Woodenware

Satinwood

Brush backs
Inlaid work

Sitka Spruce

Aeroplanes
Musical instruments, backs
Sounding boards

Southern White Cedar

Ships

Southern Yellow Pine

Agricultural implements
Automobiles
Boats
Boxes
Box car decking
Box car framing
Box car siding
Car sills
Coffins
Crates
Doors
Dump wagons
Elevators
Flooring
Fixtures
Furniture
Harvesting machines, poles
Interior finish
Machine construction
Partitions
Patterns
Reels, wire
Road-building machines
Sash
Ship spars
Silos
Spraying machines, poles, tanks
Tanks
Threshing machines
Trim
Vehicles
Woodenware

Spanish Cedar

Cigar boxes

Spruce

Agricultural implements
Aeroplanes
Baskets
Boats
Boat oars
Boxes
Box springs
Bungs
Butcher fixtures
Cable reels and spools
Car sheating
Caskets
Chairs
Cheese boxes
Crates
Doors
Elevator platforms
Farm machinery
Fixtures, backing
Fixtures, linings
Fixtures, office
Fixtures, store
Flooring
Furniture, hidden parts
Handles
Ice boxes
Instruments, musical
Instruments, scientific
Ladder sides
Laundry appliances
Machine construction
Moldings
Molding flasks
Motor vehicles
Paddles
Patterns
Piano backs
Piano benches
Piano cases
Piano ribs
Piano sounding boards
Pipe organs
Player, actions
Refrigerators, inside partitions
Road machinery
Shade rollers
Ships
Shiplap
Silos
Skids
Spars
Tanks
Tripods
Vehicles
Wagon bottoms
Wedges
Woodenware

Sugar Pine

Blinds
Doors
Interior finish
Millwork, general
Moldings
Musical instruments
Organs
Patterns
Sash
Ships
Trim
Window frames

Sycamore

Blackboards
File boards
Scientific instruments
Signs

Tamarack

Ships
Ship knees

Teak

Flooring
Ships, bearings
Ships, decks
Parquetry

Tupelo

Boxes
Caskets
Cigar boxes
Crates
Packing cases
Shipping cases
Scientific instruments
Signs

Western Red Cedar

Blinds
Boats
Doors
Interior finish
Musical instruments
Pencils
Professional instruments
Rowboats
Sash
Ship hulls
Siding

Western White Pine

Aeroplanes
Agricultural implements
Boxes
Car construction
Caskets
Matches
Ships

Western Yellow Pine

Refrigerators

White Oak

Aeroplanes
Agricultural implements
Athletic goods
Automobile wheels
Baskets
Bookcases
Boxes
Brushes
Butter tubs
Car construction
Caskets
Chairs
Clocks
Coffins
Dressers
Dumb-waiters
Elevators
Instrument cases
Interior finish
Fixtures
Flooring
Furniture
Handles, plow
Harvesters
Ladders
Laundry appliances
Locomotive bolsters and bumpers
Machine construction
Mallets
Molding
Motor vehicles
Musical instruments
Parquetry
Patterns
Picture frames
Plow beams
Plumbers' woodwork, toilet seats and tanks
Plywood
Pool tables
Pool table tops
Printing material
Pumps
Refrigerators
Rollers, land
Sash
Scientific instruments
Ships
Sleighs
Spokes
Telephone stands
Threshing machines
Typewriter tables
Toys
Vehicles
Woodenware

White Pine

Aeroplanes
Agricultural implements
Automobile bodies
Backing, pictures
Baskets
Battery boxes
Bee supplies
Blinds
Boat flooring
Boxes
Buckets
Burial boxes

Car construction
Caskets
Ceiling
Clocks
Doors
Drafting furniture
Drawing boards
Egg cases
Elevators
Fixtures
Flooring
Foundry flasks
Frames
Furniture
Interior finish
Kitchen cabinets
Ladders
Laundry appliances
Machine construction
Matches
Molding
Motor vehicles
Musical instruments
Office fixtures
Patterns
Piano key beds
Picture frames
Pipe covering
Plumbers' woodwork
Playground equipment
Porch columns
Pumps
Reels
Refrigerators
Sash
Scientific instruments
Shade rollers
Ships
Siding
Silos
Store fixtures
Tanks
Threshers
Toys
Trunks, boxes
Tubs
Vehicles
Washing machines
Water pipe
Well curbs
Wheelbarrows
Wire reels
Woodenware

Willow

Artificial limbs
Boxes

Witch Hazel

Fixtures
Furniture
Molding
Musical instruments
Partitions
Picture frames
Trim

Yellow Poplar

Aeroplanes
Agricultural implements
Automobile bodies
Baby carriages
Bamboo novelties
Baskets
Billiard tables
Boxes
Brushes
Bungs
Butter tubs
Cabinets
Cameras
Caskets, boxes
Cars, finish
Chairs
Cheese boxes
Churns
Cigar boxes
Clocks
Clothes hangers
Drafting furniture
Drills
Dumbwaiters
Egg carriers
Elevators
Excelsior
Fixtures
Furniture
Handles
Hat blocks
Instruments, musical
Instruments, professional
Interior finish

Kodaks
Ladders
Lamp standards
Laundry appliances
Mantels
Molding
Picture frames
Playground equipment
Plywood
Pool tables
Printing material
Refrigerators
Sash
Ships
Spool heads
Toys
Vehicles
Wheelbarrows
Woodenware

NEW YORK

LOCATION OF COUNTIES IN NEW YORK STATE

Directory of Manufacturers

The following is a list of the manufacturers who cooperated in the collection of the data contained in this report. Manufacturers who produce several products will appear in this list under more than one industry. Many manufacturers make boxes and crates for their own use only.

Aeroplanes

Curtiss Aeroplane & Motor Corp., 65 Churchill st	Buffalo, Erie Co.
The Curtiss Engineering Corp	Garden City, Nassau Co.
Thomas-Morse Aircraft Corp	Ithaca, Tompkins Co.
Loening Aeronautical Eng. Corp., 351–355 W. 52d st	New York, New York Co.
Smith & Smith	Springville, Erie Co.

Agricultural Implements

Stapleton Bros.	Akron, Erie Co.
Boggs Potato Grader Co., Inc	Atlanta, Steuben Co.
Henry & Allen	Auburn, Cayuga Co.
International Harvester Co	Auburn, Cayuga Co.
Quick & Thomas Co	Auburn, Cayuga Co.
Batavia Machine Co	Batavia, Genesee Co.
Massey–Harris Harvester Co., Inc	Batavia, Genesee Co.
Warsaw–Wilkinson Co.	Batavia, Genesee Co.
Wiard Plow Co	Batavia, Genesee Co.
P. E. Kennehan Son & Co	Brasher Falls, St. Lawrence Co.
Bean Harvester Co	Caledonia, Livingston Co.
L. Knott & Co	Cassadaga, Chautauqua Co.
S. K. Campbell Co., Inc	Central Bridge, Schoharie Co.
Louis H. Day	East Pembroke, Genesee Co.
M. E. True & Son	East Pembroke, Genesee Co.
Ontario Drill Co	East Rochester, Monroe Co.
Field Force Pump Co	Elmira, Chemung Co.
Friend Mfg Co	Gasport, Niagara Co.
Gowanda Agrl. Works	Gowanda, Cattaraugus Co.
Stuart Thomas	Greenport, Suffolk Co.
W. Eddy Plow Co	Greenwich, Washington Co.
W. A. Perkins	Harford Mills, Cortland Co.
R. H. Bates	Hemlock, Livingston Co.
Wm. Fletcher	Hemlock, Livingston Co.
W. A. Wood M. & R. M. Co	Hoosick Falls, Rensselaer Co.

The Babcock Mfg. Co.	Leonardsville, Madison Co.
Le Roy Plow Co.	Le Roy, Genesee Co.
Richmond Mfg. Co.	Lockport, Niagara Co.
E. U. Scoville Co.	Manlius, Onondaga Co.
Munnsville Plow Co.	Munnsville, Madison Co.
Coldwell Lawn Mower Co.	Newburgh, Orange Co.
Newfane Lumber & Mfg. Co.	Newfane, Niagara Co.
Garley Heater Co., Inc.	Olean, Cattaraugus Co.
Crown Mfg Co.	Phelps, Ontario Co.
Moline Plow Co.	Poughkeepsie, Dutchess Co.
F. B. Pease Co.	Rochester, Monroe Co.
Clark Machine Co.	St. Johnsville, Montgomery C
Westinghouse Co.	Schenectady, Schnectady Co.
Papec Machine Co.	Shortville, Ontario Co.
Star Seeder Co.	Shortville, Ontario Co.
Syracuse Chilled Plow Co.	Syracuse, Onondaga Co.
E. F. McIntyre	Union, RFD 2, Broome Co.
Eureka Mower Co.	Utica, Oneida Co.
E. S. Benham	Warsaw, Wyoming Co.
S. M. Hart	Webster, Monroe Co.
C. E. Mott	Westdale, Oneida Co.

Baskets and Fruit Packages

Albert Sparrow	Amagansett, Suffolk Co.
Attica Package Co.	Attica, Wyoming Co.
Big Indian Wood Products Co.	Big Indian, Ulster Co.
Melford Calkins	Brant, Erie Co.
Bly Bros.	Central Square, Oswego Co.
W. F. Stetson Co.	Cherry Creek, Chautauqua Co.
F. W. Barker	Coopers Plains, Steuben Co.
A. A. Hamlin	Demster, Oswego Co.
East Aurora Basket Co.	East Aurora, Erie Co.
M. E. True & Son	East Pembroke, Genesee Co.
Geo. Brasser & Son	East Rochester, Monroe Co.
W. M. F. Miller, Mill	Forestville, Chautauqua Co.
Bacon & Co.	Gasport, Niagara Co.
Gloversville Woodenware Co.	Gloversville, Fulton Co.

W. A. Perkins..... Harford Mills, Cortland Co.
R. H. Bates..... Hemlock, Livingston Co.
Wm. Fletcher..... Hemlock, Livingston Co.
Geo. W. Pratt & Son..... Highland, Ulster Co.
M. G. Terwilliger..... Highland, Ulster Co.
St. Regis Indian Trading Co..... Hogansburg, Franklin Co.
Bellair & Son..... Holland, Erie Co.

King Ferry Mill Co..... King Ferry, Cayuga Co.

Geo. L. Relyea..... Loyd, Ulster Co.
Wellington Stisser..... Lyndonville, Orleans Co.

Courbot Co., Inc..... Mallory, Oswego Co.
Royalton Basket Co..... Middleport, Niagara Co.

Wm. Downs..... New Haven, Oswego Co.
C. S. Hally..... New Haven, Oswego Co.

Acme Veneer Package Co., Inc..... Orchard Park, Erie Co.
Eastern States Pack. Co..... Orchard Park, Erie Co.
Oxford Basket & Mfg. Co..... Oxford, Chenango Co.

Barden Robeson Corp..... Pen Yan, Yates Co.
Guile & Windnagle..... Pen Yan, Yates Co.
Yates Lumber Co..... Pen Yan, Yates Co.
Pierce & Coryell..... Prattsburg, Steuben Co.

W. B. Rickenbrode Son..... Ripley, Chautauqua Co.
W. F. Royce..... Ripley, Chautauqua Co.

J. H. Simmons & Son..... Sherman, Chautauqua Co.
Lyon–Washington Lbr. Co..... Sherman, Chautauqua Co.
Sodus Crate & Basket Co..... Sodus, Wayne Co.
Dratt & Fanning..... So. Butler, Wayne Co.
Hibbard Basket Works..... So. Butler, Wayne Co.
Frederickson Bros..... Stockton, Chautauqua Co.

Excelsior Carriage Co..... Watertown, Jefferson Co.
S. M. Hart..... Webster, Monroe Co.
Webster Basket Co..... Webster, Monroe Co.
Francis Piquet..... West Monroe, Oswego Co.
E. L. Rupracht..... West Monroe, Oswego Co.

Boot and Shoe Findings

Albany Last Co..... Albany, Albany Co.
Wallace McCoy..... Allegany, Cattaraugus Co.

Seger–Prindle Mfg. Co..... Belvidere, Allegany Co.
J. S. Charles..... Bliss, Wyoming Co.
American Wood Heel Co., 62 Glenmore av. Brooklyn, Kings Co.
Atlantic Wood Heel Co., 322 Van Buren st. Brooklyn, Kings Co.
French Wood Heel Co., 20 George st..... Brooklyn, Kings Co.
R. S. McNeill Co., 57–59 Jay st..... Brooklyn, Kings Co.

Manhattan Wood Heel Co., 600 Kent av...	Brooklyn, Kings Co.
P. Meyer Wooden Heel Co., 1906 Atlantic av.	Brooklyn, Kings Co.
N. Y. Wood Heel Co., 29 Quincy st.....	Brooklyn, Kings Co.
Williamsburg Wood Heel Co., Inc., 641–643 Lexington av.....	Brooklyn, Kings Co.
Ellicottville Mfg. Co.....	Ellicottville, Cattaraugus Co.
Fitzpatrick & Weller (also at Salamanca).	Ellicottville, Cattaraugus Co.
E. K. Washburne.....	Franklinville, Cattaraugus Co.
Alfred P. Kingston.....	Little Falls, Herkimer Co.
Jasper Johnson	Machias Junction, Cattaraugus Co.
Natural Bridge Mfg. Co.....	Natural Bridge, Jefferson Co.
Daush Wood Heel Co., 519 W. 30th st....	New York, New York Co.
New York Last Co., 431–11th st.....	New York, New York Co.
Simon Roth Wood Heel Co., 10 Ferry st...	New York, New York Co.
The Stewart & Potter Co., 191 Worth st...	New York, New York Co.
Empire Last Works — Branch United Last Co.	Rochester, Monroe Co.
Rochester Last Works.....	Rochester, Monroe Co.
Fitzpatrick & Weller (also at Ellicottville).	Salamanca, Cattaraugus Co.

Boxes and Crates

William Smith	Addison, Steuben Co.
H. W. Draper	Albany, Albany Co.
F. C. Huyck & Sons.....	Albany, Albany Co.
T. F. Romeyn.....	Albany, Albany Co.
C. M. Mallory	Albion, Orleans Co.
Bennett Mfg. Co.....	Alden, Erie Co.
Emblem Mfg. Co.....	Angola, Erie Co.
Merrill Soule Co.....	Arcade, Wyoming Co.
Oak Knitting Co.....	Arcade, Wyoming Co.
Westinghouse Electric & Mfg. Co.....	Attica, Wyoming Co.
Henry & Allen	Auburn, Cayuga Co.
International Harvester Co.....	Auburn, Cayuga Co.
David Wadsworth & Son.....	Auburn, Cayuga Co.
W. R. Prouty	Bainbridge, Chenango Co.
Morris Machine Works.....	Baldwinsville, Onondaga Co.
L. M. Tappen	Baldwinsville, Onondaga Co.
William Carroll & Co., Inc.....	Beacon, Dutchess Co.
Dutchess Tool Co.....	Beacon, Dutchess Co.
National Oven Co.....	Beacon, Dutchess Co.
C. A. Buffington & Co.....	Berkshire, Tioga Co.
W. J. Cowee	Berlin, Rensselaer Co.
Big Indian Wood Products Co.....	Big Indian, Ulster Co.
Binghamton Chair Co.....	Binghamton, Broome Co.

Kroehler Mfg. Co., Inc.	Binghamton, Broome Co.
The Wilkinson Mfg. Co	Binghamton, Broome Co.
W. G. Case & Co	Black River, Jefferson Co.
Shields Bros.	Bombay, Franklin Co.
Milford Calkins	Brant, Erie Co.
Charles Vail	Broadalbin, Fulton Co.
E. J. Armstrong, 373 Flushing av	Brooklyn, Kings Co.
W. R. Coffee, 281 Plymouth st	Brooklyn, Kings Co.
Eclipse Box & Lumber Co., Inc., Greenpoint av. & Newton Creek	Brooklyn, Kings Co.
J. Friedland Co., 295 Greenpoint av	Brooklyn, Kings Co.
Gasau-Thompson Co., 16 Ashland pl	Brooklyn, Kings Co.
Greenpoint Box & Lumber Co., 43 Dobbin st.	Brooklyn, Kings Co.
Chas. H. Gimpel, 230 39th st	Brooklyn, Kings Co.
J. D. Johnson Co., Inc., Boerum pl. & State st.	Brooklyn, Kings Co.
National Packing Box Co., 298 Nevins st	Brooklyn, Kings Co.
New York Bottle Box Co., 470–472 Rodney st.	Brooklyn, Kings Co.
Queensboro Box & Lumber Co., 300 Richardson st.	Brooklyn, Kings Co.
Geo. H. Reeves, Inc., 290 Green st	Brooklyn, Kings Co.
O. S. Richards Corp.	Brooklyn, Kings Co.
Unity Box & Lbr. Co., Inc., 668 Driggs av.	Brooklyn, Kings Co.
Wood Packing Box Co., 370 Johnson av	Brooklyn, Kings Co.
Brownville Paper Co	Brownville, Jefferson Co.
Brownville Ventilated Column Wks	Brownville, Jefferson Co.
American Radiator Co	Buffalo, Erie Co.
Barcalo Mfg. Co., 225 Louisiana st	Buffalo, Erie Co.
C. M. Bott Furniture Co., 170 Leslie st	Buffalo, Erie Co.
Buffalo Lounge Co	Buffalo, Erie Co.
Buffalo Pitts Co., 27 Carolina st	Buffalo, Erie Co.
F. N. Burt Co., Ltd., Seneca & Hamburg sts.	Buffalo, Erie Co.
Davenport & Ridley, 1128 Seneca st	Buffalo, Erie Co.
G. Elias & Bro., Inc	Buffalo, Erie Co.
Ford Motor Car Co., 2495 Main st	Buffalo, Erie Co.
Graves, Manbert & Geroge, Inc	Buffalo, Erie Co.
Greenwood Chair Co., 70 Oneida st	Buffalo, Erie Co.
Hersey & Co	Buffalo, Erie Co.
E. & B. Holmes Machinery Co	Buffalo, Erie Co.
The Jewett Refrigerator Co	Buffalo, Erie Co.
Kittinger Co., Inc., 1893 Elmwood av	Buffalo, Erie Co.
MacLean Box Factory, 160–170 Elk st	Buffalo, Erie Co.
Meyer Wagon Works	Buffalo, Erie Co.
Montgomery Bros. Co., Court & Wilkinson sts.	Buffalo, Erie Co.
Niagara Box Co	Buffalo, Erie Co.
Niagara Machine & Tool Works, 683 Northland av.	Buffalo, Erie Co.
Otis Elevator Co	Buffalo, Erie Co.
Pierce-Arrow Motor Car Co., 1595 Elmwood av.	Buffalo, Erie Co.

H. E. Holbrook Co.	Caledonia, Livingston Co.
W. F. Babcock	Camden, Oneida Co.
F. H. Conants Sons, Inc.	Camden, Oneida Co.
George W. Dana	Camden, Oneida Co.
F. P. Linderman & Son	Cameron, Steuben Co.
Lisk Mfg. Co.	Canandaigua, Ontario Co.
Lenox Shops, Inc.	Canastota, Madison Co.
J. E. Talley	Canastota, Madison Co.
Booth Fisheries Co.	Cape Vincent, Jefferson Co.
H. W. Field	Cassadaga, Chautauqua Co.
Climax Mfg. Co.	Castorland, Lewis Co.
Oakes & Burger Co.	Cattaraugus, Cattaraugus Co.
Judd & Leland Mfg. Co.	Clifton Springs, Ontario Co.
M. Breault Co.	Cohoes, Albany Co.
J. C. Fish	Corbettsville, Broome Co.
Brockway Motor Truck Co.	Cortland, Cortland Co.
Champion Milk Cooler Co.	Cortland, Cortland Co.
Edlund Machinery Co., Inc.	Cortland, Cortland Co.
H. W. Newton	Cortland, Cortland Co.
Wickwire Bros.	Cortland, Cortland Co.
American Valve Co.	Coxsackie, Greene Co.
American Assembling Mch. Co.	Croton Falls, Westchester Co.
American Locomotive Co.	Dunkirk, Chautauqua Co.
Atlas Crucible Steel Co.	Dunkirk, Chautauqua Co.
Continental Heater Co.	Dunkirk, Chautauqua Co.
Empire Axle Co.	Dunkirk, Chautauqua Co.
Essex Glass Co.	Dunkirk, Chautauqua Co.
George H. Graf Co.	Dunkirk, Chautauqua Co.
Hanford Bros.	East Meredith, Delaware Co.
Pierce, Butler & Pierce	Eastwood, Onondaga Co.
Stickley Mfg. Co.	Eastwood, Onondaga Co.
A. D. Morton	Eaton, Madison Co.
Dwight, Devine & Sons	Ellenville, Ulster Co.
F. M. Howell & Co.	Elmira, Chemung, Co.
I. T. R. Co.	Endicott, Broome Co.
Supreme Furniture Co.	Falconer, Chautauqua Co.
Muller & Buckley	Far Rockaway, Queens Co.
J. & J. G. Stickley, Inc.	Fayetteville, Onondaga Co.
Tindale Cabinet Co.	Flushing, Queens Co.
The Bailey Knitting Mills	Fort Plain, Montgomery Co.
Fort Plain Knitting Co.	Fort Plain, Montgomery Co.
Alphonso Walrath Co.	Fort Plain, Montgomery Co.
Franklinville Canning Co.	Franklinville, Cattaraugus Co.
Silts Machine Shop	Fulton, Oswego Co.
J. A. Cross Mfg. Co.	Fultonville, Montgomery Co.
Doubleday Page & Co.	Garden City, Nassau Co.
Burr Lumber Co.	Gloversville, Fulton Co.
Lyon Iron Works	Greene, Chenango Co.
Wood & Chute	Greenport, Suffolk Co.
W. Eddy Plow Co.	Greenwich, Washington Co.
American Road Machinery Co.	Groton, Tompkins Co.
Groton Electrical Devices, Inc.	Groton, Tompkins Co.

Hammondsport Box Factory	Hammondsport, Steuben Co.
Horrocks Desk Co	Herkimer, Herkimer Co.
H. M. Quackenbush	Herkimer, Herkimer Co.
Wagner Furniture Co	Herkimer, Herkimer Co.
Noble & Wood Machinery Co	Hoosick Falls, Rensselaer Co.
J. M. Deutsch Co	Hornell, Steuben Co.
Nestles Food Co	Horseheads, Chemung Co.
Library Bureau	Ilion, Herkimer Co.
A. N. Russell & Sons Co	Ilion, Herkimer Co.
Advance Furniture Co., Inc	Jamestown, Chautauqua Co.
Art Metal Construction Co	Jamestown, Chautauqua Co.
Elite Furniture Co	Jamestown, Chautauqua Co.
Empire Case Goods Co	Jamestown, Chautauqua Co.
International Casement Co., Inc	Jamestown, Chautauqua Co.
Jamestown Chair Co	Jamestown, Chautauqua Co.
Jamestown Period Furniture Co	Jamestown, Chautauqua Co.
Monarch Furniture Co	Jamestown, Chautauqua Co.
The A. C. Norquist Co	Jamestown, Chautauqua Co.
Seaburg Mfg. Co	Jamestown, Chautauqua Co.
The Star Furniture Co., Inc	Jamestown, Chautauqua Co.
Superior Furniture Co	Jamestown, Chautauqua Co.
Weborg Bros. Spring Bed Co	Jamestown, Chautauqua Co.
Lestershire Lumber & Box Co	Johnson City, Broome Co.
C. L. Meech	Jordan, Onondaga Co.
Ausable–Essex Horse Nail Co	Keesville, Essex Co.
Oneida Community, Ltd	Kenwood, Madison Co.
Herbert Brush Mfg. Co	Kingston, Ulster Co.
Adam Walburger	Lafayette, Onondaga Co.
Industrial Glass Co	Lancaster, Erie Co.
Lancaster Machine & Knife Works	Lancaster, Erie Co.
National Enamel & Stamping Co	Laurel Hill, Suffolk Co.
American Laundry Machine Co	Lincoln Park, Monroe Co.
Frank Bowman	Little Falls, Herkimer Co.
D. H. Burrell & Co., Inc	Little Falls, Herkimer Co.
C. J. Lindstrom Mfg. Co	Little Falls, Herkimer Co.
H. P. Snyder Mfg. Co	Little Falls, Herkimer Co.
Murphy Bros	Livonia, Livingston Co.
Cochran Box & Mfg. Co., Inc	Lockport, Niagara Co.
Evans & Co	Lockport, Niagara Co.
Merritt Mfg. Co	Lockport, Niagara Co.
Richmond Mfg. Co	Lockport, Niagara Co.
Trevor Mfg. Co	Lockport, Niagara Co.
Joseph Turner	Lockport, Niagara Co.
Klein Bros	Long Island City, Queens Co.
Central Paper Box Co	McGraw, Cortland Co.
The Courbot Co., Inc	Mallory, Oswego Co.
S. Cheney & Son	Manlius, Onondaga Co.
Frank Morrison	Marion, Wayne Co.
George C. Topping	Marion, Wayne Co.
The Blaisdell Mfg. Co	Martville, Cayuga Co.

New York Rubber Co.	Matteawan, Dutchess Co.
Medina Wood Working & Fur. Co., Inc.	Medina, Orleans Co.
Ideal Wrapping Machine Co.	Middletown, Orange Co.
Morgans & Wilcox Mfg. Co.	Middletown, Orange Co.
Cronk & Carrier Mfg. Co.	Montour Falls, Schuyler Co.
Shepard Elec. Crane & Hoist Co.	Montour Falls, Schuyler Co.
Empire Machine Works	Mount Morris, Livingston Co.
Grubb & Kosegarten Bros.	Nassau, Rensselaer Co.
American Can Co., 120 Broadway	New York, New York Co.
American Hard Rubber Co., 11 Mercer st.	New York, New York Co.
Artists Packing & Shipping Co., 139 W. 54th st.	New York, New York Co.
Semon Bache & Co., 636 Greenwich st.	New York, New York Co.
L. Baldasky & Co., Inc., 537 E. 15th st.	New York, New York Co.
John A. Bank & Bro., 510 E. 72d st.	New York, New York Co.
Fred Bieg Box Co., Inc., 40–42 Gold st.	New York, New York Co.
Estate of Frederick Buse, 1110 First av.	New York, New York Co.
Carolina Box & Lumber Co., 38 Commerce st.	New York, New York Co.
Carroll Box & Lumber Co., 627 E. 18th st.	New York, New York Co.
City Packing Box Co., 624 E. 19th st.	New York, New York Co.
Consolidated Packing Box & Lumber Co., Inc., 568–572 Washington st.	New York, New York Co.
De La Vergne Machine Co., Foot of E. 138th st.	New York, New York Co.
Downtown Packing Box Co., 79–81 Cliff st.	New York, New York Co.
Dunbar Box & Lumber Co., 551 W. 28th st.	New York, New York Co.
Eagle Box & Lumber Co., 128 Greene st.	New York, New York Co.
Epstein & Vollweiler, 814 E. 5th st.	New York, New York Co.
James Fagan & Sons, 202 West Houston st.	New York, New York Co.
Faultless Box & Lumber Co., 301 E. 21st st.	New York, New York Co.
Finkelstein Packing Box Co., 131 W. 3d st.	New York, New York Co.
J. H. Fitzgerald, Inc., 532 W. 20th st.	New York, New York Co.
Forest Box & Lumber Co., 149 Mercer st.	New York, New York Co.
E. Gerow, 450 Eleventh av.	New York, New York Co.
M. Gerow & Sons, 450 Eleventh av.	New York, New York Co.
M. Gershowitz, 128 Greene st.	New York, New York Co.
J. A. Gilmour, 23 Bond st.	New York, New York Co.
M. Gottlieb & Sons, 20 Clarke st.	New York, New York Co.
Harlem Storage Warehouse Co., 211–213 E. 100th st.	New York, New York Co.
Charles Korn, 8 Bond st.	New York, New York Co.
The Laffargue Co., 134th st. & S. Boulevard	New York, New York Co.
The Manhattan Box Co., 410 E. 32d st.	New York, New York Co.
Manhattan Show Case Co., 359 Canal st.	New York, New York Co.
D. Milch, 131 W. 41st st.	New York, New York Co.
Terence Montagu, 10 York st.	New York, New York Co.
John E. Moore, 588 Greenwich st.	New York, New York Co.
T. G. Patterson Lumber Co., 637 W. 55th st	New York, New York Co.
Rosenthal & Cohen, 53 Great Jones st.	New York, New York Co.
P. Ryan, 556 Washington st.	New York, New York Co.
Shwab Bros. Co., 311 E. 9th st.	New York, New York Co.
Star Box & Lumber Co., 81 Tompkins st.	New York, New York Co.
Stulman Box & Lumber Co., 20 Wooster st.	New York, New York Co.
Tifft Bros., 2 Broadway	New York, New York Co.

Valance & Grosjean, 299 Broadway	New York, New York Co.
Van Kannel Revolving Door Co., 716 Whitlock av	New York, New York Co.
F. Vogel & Co., 222 East 37th st	New York, New York Co.
United Forestry Co., Inc	Niverville, Columbia Co.
Alliger Box & Lumber Co	No. Tonawanda, Niagara Co.
Batt Bros. Lumber Co	No. Tonawanda, Niagara Co.
Dock & Mill Co	No. Tonawanda, Niagara Co.
Dodge & Bliss Co	No. Tonawanda, Niagara Co.
Allen Herschell Co	No. Tonawanda, Niagara Co.
The R. T. Jones Lumber Co	No. Tonawanda, Niagara Co.
North Tonawanda Musical Instruments	No. Tonawanda, Niagara Co.
W. G. Palmer, Inc	No. Tonawanda, Niagara Co.
The Rand Co	No. Tonawanda, Niagara Co.
Richardson Boat Co	No. Tonawanda, Niagara Co.
White-Gratwick-Mitchell	No. Tonawanda, Niagara Co.
Rudolph Wurlitzer Mfg. Co	No. Tonawanda, Niagara Co.
Foot Mfg. Co	No. Tonawanda, Niagara Co.
Acme Glass Co	Olean, Cattaraugus Co.
Hathaway & Reynolds	Oriskany Falls, Oneida Co.
Ames Iron Works	Oswego, Oswego Co.
National Starch Co	Oswego, Oswego Co.
Oswego Shade Cloth Co	Oswego, Oswego Co.
Standard Oil Co., of New York	Oswego, Oswego Co.
Painted Post Development Co	Painted Post, Steuben Co.
The Garlock Packing Co	Palmyra, Wayne Co.
C. F. Powers & Son	Palmyra, Wayne Co.
Cortland Hat Co., Inc	Peekskill, Westchester Co.
Sinclair Chair Co	Phoenix, Oswego Co.
Century Steel Co. of America	Poughkeepsie, Dutchess Co.
Moline Plow Co	Poughkeepsie, Dutchess Co.
Pouvailsmith Corp.	Poughkeepsie, Dutchess Co.
Pierce & Coryell	Plattsburg, Clinton Co.
Salmon River Table Co	Pulaski, Oswego Co.
William Wilder	Pulaski, Oswego Co.
Seneca Furniture Corp	Randolph, Cattaraugus Co.
W. Yates Lansing	Rensselaer, Rensselaer Co.
The American Laundry Machine Co	Rochester, Monroe Co.
Archer Mfg. Co., 187 N. Water st	Rochester, Monroe Co.
Barnard & Simonds Co	Rochester, Monroe Co.
Chase Bros. Co	Rochester, Monroe Co.
Cooperative Foundry Co	Rochester, Monroe Co.
D. E. Cross, 49 South av	Rochester, Monroe Co.
Eastman Kodak Co	Rochester, Monroe Co.
General Railway Signal Co	Rochester, Monroe Co.
Langslow-Fowler Co	Rochester, Monroe Co.
George J. Michelsen Furniture Co	Rochester, Monroe Co.
The Pfaudler Co	Rochester, Monroe Co.
The Ricker Mfg. Co	Rochester, Monroe Co.
Rochester Barrel Mch. Works	Rochester, Monroe Co.
Rochester Show Case Works, 404 Platt st.	Rochester, Monroe Co.
Rochester Box & Lbr. Co., Culver rd	Rochester, Monroe Co.

Traders Box & Lbr. Co., 1040 Jay st	Rochester, Monroe Co.
Yawman & Erbe Mfg. Co	Rochester, Monroe Co.
Rome Box & Lbr. Co	Rome, Oneida Co.
Joseph Fahys & Co	Sag Harbor, Suffolk Co.
Fancher Furniture Co	Salamanca, Cattaraugus Co.
Sterling Furniture Co	Salamanca, Cattaraugus Co.
American Locomotive Works	Schenectady, Schenectady Co.
General Electric Co	Schenectady, Schenectady Co.
W. Cady Smith	Schenectady, Schenectady Co.
F. A. Guernsey & Co	Schoharie, Schoharie Co.
Fulton Furniture Co., Inc	Shandaken, Ulster Co.
G. A. Clark Co	Sidney, Delaware Co.
Huntley Mfg. Co	Silver Creek, Chautauque Co.
Invincible Grain Cleaner Co	Silver Creek, Chautauqua Co.
H. J. Montgomery Mfg. Co	Silver Creek, Chautauqua Co.
Hooker & Higgs	Sinclairville, Chautauqua Co.
The Schoeck Mfg. Co	Skaneateles, Onondaga Co.
R. M. Brower	Sodus Center, Wayne Co.
B. F. Gladding & Co., Inc	South Otselic, Chenango Co.
Elwood Barringer	Springwater, Livingston Co.
Frank H. Stuart	Springwater, Livingston Co.
Overton Mfg. Co	Staatsburg, Dutchess Co.
Staatsburg Ice Tool Works	Staatsburg, Dutchess Co.
Leslie E. Youngs	Stanley, Ontario Co.
C. C. Bradley & Son	Syracuse, Onondaga Co.
Continental Can Co., Inc	Syracuse, Onondaga Co.
The Cook Box & Lumber Co., 2613 Lodi st	Syracuse, Onondaga Co.
The O. M. Edwards Co., Inc	Syracuse, Onondaga Co.
Engelberg Huller Co	Syracuse, Onondaga Co.
Halcomb Steel Co., Geddes st	Syracuse, Onondaga Co.
John H. Lyons, Inc., 542 Canal st	Syracuse, Onondaga Co.
Market Mfg. Co., 618 E. Water st	Syracuse, Onondaga Co.
H. A. Moyer, 241 Wolf st	Syracuse, Onondaga Co.
Onondaga Steel Co., Inc	Syracuse, Onondaga Co.
Quaint Art Furniture Co	Syracuse, Onondaga Co.
F. H. Schneider, 631 Belden av	Syracuse, Onondaga Co.
Uhle-Kramer Box Co., 408–12 Canal st	Syracuse, Onondaga Co.
Chevrolet Motor Car Co	Tarrytown, Westchester Co.
Wilson Lumber & Box Co	Tonawanda, Erie Co.
Bascom Pattern Works	Troy, Rensselaer Co.
Cluett, Peabody & Co., Inc	Troy, Rensselaer Co.
W. & L. E. Gurley	Troy, Rensselaer Co.
Hall Hartwell & Co	Troy, Rensselaer Co.
Century Cabinet Co	Utica, Oneida Co.
Jacob Fassler	Utica, Oneida Co.
Utica Knitting Co	Utica, Oneida Co.
Uebler Mfg. Co	Vernon, Oneida Co.
Rider-Ericson Engine Co	Walden, Orange Co.
Garner Print Works & Bleachery	Wappinger Falls, Dutchess Co.

Brown Knitting Co	Warsaw, Wyoming Co.
Warsaw Paper Box Co	Warsaw, Wyoming Co.
H. H. Babcock Co	Watertown, Jefferson Co.
Knowlton Bros.	Watertown, Jefferson Co.
The New York Air Brake Co	Watertown, Jefferson Co.
Plail Bros.	Wayland, Steuben Co.
J. D. Nivison	Webster, Monroe Co.
George Boardway	West Bangor, Franklin Co.
George J. J. Druschel	West Walworth, Wayne Co.
Quigley Furniture Co	Whitesboro, Oneida Co.
W. B. Allen	Whitney Point, Broome Co.
Otis Elevator Co	Yonkers, Westchester Co.

Brushes and Brooms

Williams & Hurd	Arlington, R. F. D. No. 1, Bennington Co., Vt.
L. Noellers Sons, 43–47 Locust st	Buffalo, Erie Co.
Brannan Mfg. Co	Carthage, Jefferson Co.
H. A. Williams	Hancock, Delaware Co.
Herbert Brush Mfg. Co	Kingston, Ulster Co.
Henry Peak	Long Eddy, Sullivan Co.
A. L. Sonn Brush Co	North Troy, Rensselaer Co.
A. Mason & Sons	Peru, Clinton Co.
United States Brush Co	Potsdam, St. Lawrence Co.
Nicholas J. Karl, 168 N. Water st	Rochester, Monroe Co.
Alpha Brush Co	Troy, Rensselaer Co.
Diack Bros	Troy, Rensselaer Co.
Flynn Bros	Troy, Rensselaer Co.
Fred'k M. Hoyt & Bro	Troy, Rensselaer Co.
Henry I. Hughes Co	Troy, Rensselaer Co.
Reliable Brush Co	Troy, Rensselaer Co.
Rensselaer Brush Co	Troy, Rensselaer Co.
Unity Brush Co	Troy, Rensselaer Co.

Car Construction

Pittsburg, Shawmut & Northern R. R. Co	Angelica, Allegany Co.
Mortonsen Wood Working Co., Inc., 554 Hamilton av	Brooklyn, Kings Co.
Pennsylvania R. R. Co	Buffalo, Erie Co.
Pullman Co., 1770 Broadway	Buffalo, Erie Co.
American Locomotive Co	Dunkirk, Chautauqua Co.
N. Y., Ontario & W. R. R. Co	Middletown, Orange Co.

New York Central R. R.	New York, New York Co.
Long Island Railroad	Richmond Hill, Queens Co.
American Locomotive Works	Schenectady, Schenectady Co.
Lehigh & Hudson River R. R.	Warwick, Orange Co.
D. & H. R. R. Co. "Colonie"	Watervliet, Albany Co.

Caskets and Coffins

Morgan Casket Co., 572–590 Park av.	Brooklyn, Kings Co.
N. Y. & Brooklyn Casket Co., 703 Bedford av.	Brooklyn, Kings Co.
Central Casket Co., 45 Niagara st	Buffalo, Erie Co.
A. W. Hawley	Colton, St. Lawrence Co.
H. R. Taylor Corp.	Cornwall, Orange Co.
Younglove Casket Co	Johnstown, Fulton Co.
H. W. Palen's Sons	Kingston, Ulster Co.
National Casket Co	Long Island City, Queens Co.
Asbestos Burial Casket Co	Lowville, Lewis Co.
Hornthal & Co., 597 Lexington av	New York, New York Co.
J. P. Linahan, 100 E. 138th st	New York, New York Co.
J. & J. W. Stolts, 440 E. 106th st	New York, New York Co.
H. E. Taylor & Co., 154 E. 23d st	New York, New York Co.
Norwood Casket Co	Norwood, St. Lawrence Co.
Nunda Casket Co., Inc.	Nunda, Livingston Co.
National Casket Co	Oneida, Madison Co.
National Casket Co	Rochester, Monroe Co.
John Marsellus Casket Co	Syracuse, Onondaga Co.
Monroe Mfg. Co	Webster, Monroe Co.
O'Dell Bros	Webster, Monroe Co.
Wellsville Burial Case Co	Wellsville, Allegany Co.

Chairs and Chair Stock

F. W. Elant	Arkville, Delaware Co.
C. J. Harrison Mfg. Co	Arkville, Delaware Co.
Binghamton Chair Co	Binghamton, Broome Co.
N. M. Sargent's Sons	Boonville, Oneida Co.
P. C. Prevett	Broadalbin, Fulton Co.
C. H. Trevett	Broadalbin, Fulton Co.
Sikes Chair Co., 500 Clinton st	Buffalo, Erie Co.

F. H. Conant's Sons, Inc..... Camden, Oneida Co.
J. M. Young & Sons..... Camden, Oneida Co.
Lee Chair Co..... Canastota, Madison Co.
C. J. Armstrong & Sons..... Cherry Valley, Otsego Co.
Wm. Schwarzwaelder & Co., Inc..... Chichester, Ulster Co.

Jamestown Chair Co..... Jamestown, Chautauqua Co.
Superior Furniture Co..... Jamestown, Chautauqua Co.

Frank D. Harden Co..... McConnellsville, Oneida Co.
Empire Couch Co..... Medina, Orleans Co.
Charles J. Armstrong & Sons..... Milford, Otsego Co.
The Mottville Chair Works..... Mottville, Onondaga Co.
Sinclair Allen Mfg. Co..... Mottville, Onondaga Co.

Herbert G. Pratt..... Newburgh, Orange Co.
George Hunzinger & Son, 325 W. 16th st.. New York, New York Co.
Marks Invalid Supply Co., 212 E. 41st st.. New York, New York Co.
John Miller & Co., 518 E. 17th st..... New York, New York Co.
N. Y. Chair Co., 164 Mulberry st..... New York, New York Co.
Schilling Bros. Table Co., 631 E. 16th st.. New York, New York Co.

Sinclair Chair Co..... Phoenix, Oswego Co.
Poughkeepsie Chair Co..... Poughkeepsie, Dutchess Co.

Archer Mfg. Co..... Rochester, Monroe Co.
Barnard & Simonds Co..... Rochester, Monroe Co.
Hubbard, Eldredge & Miller..... Rochester, Monroe Co.
C. M. Lenhard..... Rochester, Monroe Co.

The Shreve Chair Co..... Sherman, Chautauqua Co.
H. J. Montgomery Mfg. Co..... Silver Creek, Chautauqua Co.

W. H. Gunlock Chair Co..... Wayland Steuben Co.
W. E. Sprague..... Westdale, Oneida Co.

Clocks

Ansonia Clock Co., Seventh av. & 12th st.. Brooklyn Kings Co.

John A. Bank & Bro., 510 E. 72d st..... New York, New York Co.

Henry Salzler ..... Springville, Erie Co.

Cigar Boxes

J. Berleant, 603 Clinton st..... Buffalo, Erie Co.
Louis Doebert ..... Buffalo, Erie Co.

F. M. Howell & Co..... Elmira, Chemung Co.

Philip Fehl ..... Hudson, Columbia Co.

Lyons Mfg. Co..... Lyons, Wayne Co.

Nic. Althaus Co., 637–641 E. 17th st	New York, New York Co.
S. Elkeles Cigar Box Co., 535 E. 79th st.	New York, New York Co.
Schwarzkopf & Ruckert, 413–415–417 E. 36th st	New York, New York Co.
S. Sladkus & Son, 392 Madison st	New York, New York Co.
Charles Stutz Co., 283–289 Monroe st	New York, New York Co.
J. C. Van Brunt & Son, 291 Monroe st	New York, New York Co.
Louis Walter, Inc., 132d st. & Lincoln av.	New York, New York Co.
L. F. Schlecht, 316–318 E. Water st	Syracuse, Onondaga Co.

Dairymen's, Poulterers', and Apiarists' Supplies

Gilbert Gale	Barnerville, Schoharie Co.
Charles Quackenbush	Barnerville, Schoharie Co.
A. A. French	Black River, Jefferson Co.
D. Karlen	Boonville, Oneida Co.
E. W. Coon	Cape Vincent, Jefferson Co.
Oakes & Burger Co	Cattaraugus, Cattaraugus Co.
C. L. Sancomb	Chateaugay, Franklin Co.
W. F. Stetson Co	Cherry Creek, Chautauqua Co.
Meldrim Bros	Cincinnatus, Cortland Co.
C. H. Payne	Cold Brook, Herkimer Co.
The Steam Mill Co	Constableville, Lewis Co.
C. V. Peck	Cortland, Cortland Co.
Joseph Steiner	Croghan, Lewis Co.
Stanley C. Swift Mfg. Co	Cuba, Allegany Co.
Sternberg Bros	Depauville, Jefferson Co.
American Mfg. Concern	Falconer, Chautauqua Co.
Hollenbeck & Son	Ft. Jackson, St. Lawrence Co.
Edward W. Gossett	Frewsburg, Chautauqua Co.
Fred Sauer & Sons	Glenmore, Oneida Co.
E. C. Lawton	Gouverneur, St. Lawrence Co.
Block Bros	Great Valley, Cattaraugus Co.
G. B. Gerard Mills	Holland Patent, Oneida Co.
Edward L. Gossett	Jamestown, Chautauqua Co.
W. S. Sammons	Johnstown, Chautauqua Co.
C. Hargrave	Laurens, Otsego Co.
F. C. Rogers	Le Roy, Genesee Co.
Hall Mammoth Incubator Co	Little Falls, Herkimer Co.
The Courbot Co	Mallory, Oswego Co.
D. S. Mawson & Sons	Manlius, Onondaga Co.
G. H. Whittaker	Marcy, Oneida Co.
R. R. Ripley	Morris, Otsego Co.
W. N. Cardner	New Woodstock, Madison Co.
Charles E. Gue	North Western, Oneida Co.

Fred Babcock	Orwell, Oswego Co.
W. S. Brooks	Philadelphia, Jefferson Co
Morrison, Blair, & Co	Rensselaer Falls, St. Lawrence Co.
Charles Mills	Richfield Sprgs., Otsego Co.
John G. Elbs, 397 Main st	Rochester, Monroe Co.
L. C. McElheny	Rushford, Allegany Co.
D. S. Tilyon	Vanhornesville, Herkimer Co.
W. L. Spink	Varysburg, Wyoming Co.
Charles H. Hess	Vernon Center, Oneida Co.
H. R. Myers	Waterville, Oneida Co.
Wellsville Custom Co	Wellsville, Allegany Co.
C. C. & F. R. Wellington	West Stockholm, St. Lawrence Co.
F. A. Capron	West Valley, Cattaraugus Co.
A. C. Hackley	West Winfield, Herkimer Co.
C. T. Dickinson	Whitney Point, Broome Co.
G. S. Van Buskirk	Wiscoy, Allegany Co.

Dowels & Skewers

Horton Lumber Co	Altmar, Oswego Co.
W. J. Cowee	Berlin, Rensselaer Co.
Setter Bros. Co	Cattaraugus, Cattaraugus Co.
Acme Reed Co	Woodside, Queens Co.

Electrical Machinery and Apparatus

Gould Coupler Co	Depew, Erie Co.
Gen. Railway Signal Co	Rochester, Monroe Co.
Beach Lumber Co	Rome, Oneida Co.
General Electric Co	Schenectady, Schenectady Co.

Elevators

Otis Elevator Co	Buffalo, Erie Co.
Smith Elevator Co., Inc., 301 Liberty bldg.	Buffalo, Erie Co.
Acme Road Machinery Co	Frankfort, Herkimer Co.
Anton Larsen & Sons, Brook av. & 134th st.	New York, New York Co.
Republic Elevator & Machine Co	Rochester, Monroe Co.
Warsaw Elevator Co	Warsaw, Wyoming Co.
Otis Elevator Co	Yonkers, Westchester Co.

Excelsior

Big Indian Wood Products Co	Big Indian, Ulster Co.
Chateaugay Excelsior Co	Chateaugay, Franklin Co.
New York Excelsior Co	East Branch, Delaware Co.
F. M. Blystone, Inc	Elmira, Chemung Co.
Chas. M. Allen, Inc	Fulton, Oswego Co.
David & Mason	Fulton, Oswego Co.
National Desk Co	Herkimer, Herkimer Co.
Fenton & Dence, Inc	Lowville, Lewis Co.
Port Leyden Excelsior Co	Lowville, Lewis Co.
Chas. Harden Estate	McConnellsville, Oneida Co.
F. E. Sheffield	Mooers, Clinton Co.
H. J. Weiden	Narrowsburg, Sullivan Co.
Boston Excelsior Co., Eleventh av. & 29th st.	New York, New York Co.
North River Mfg. Co	North Creek, Warren Co.
J. H. Wilder	Petries Corners, Lewis Co.
Gromley Bros.	Phoenicia, Ulster Co.
Harry Cunningham	Warrensburg, Warren Co.

Firearms

The Hunter Arms Co., Inc	Fulton, Oswego Co.
The Remington Arms Union Metallic Cartridge Co	Ilion, Herkimer Co.
Ithaca Gun Co	Ithaca, Tompkins Co.
Savage Arms Corp	Utica, Oneida Co.

Fixtures

E. B. & H. J. Koon	Auburn, Cayuga Co.
American Show Case Co., 289 Greenport av.	Brooklyn, Kings Co.
Columbia Mantel Co., 274 Leonard st	Brooklyn, Kings Co.
Eagle Show Case Co., 899 Myrtle av	Brooklyn, Kings Co.
Eastern Show Case Co., 470 Park pl	Brooklyn, Kings Co.
Eichman Co., 7 McKibben	Brooklyn, Kings Co.
Frederick Elflein & Sons, Inc, 216–226 Seigel st	Brooklyn, Kings Co.
E. Hamburger & Co., 139 Emerson pl	Brooklyn, Kings Co.
Interstate Parlor Frame Co., 280 Leonard st.	Brooklyn, Kings Co.
Manhattan Show Case Co., 265 Calyer st	Brooklyn, Kings Co.

Schwartz & Co., 87–105 Richardson st....	Brooklyn, Kings Co.
Toyeson Partition Co., 291 Adams st....	Brooklyn, Kings Co.
M. J. Bernhard Co., Inc., 712–720 Jefferson st.	Buffalo, Erie Co.
A. Dutch & Co., 148 Seneca st.....	Buffalo, Erie Co.
A. F. Meyer & Sons Co., 408 Broadway....	Buffalo, Erie Co.
Queen City Store Fixture Co., 431 William st.	Buffalo, Erie Co.
George W. Dana.....	Camden, Oneida Co.
William Schwarzwaelder & Co., Inc.....	Chichester, Ulster Co.
M. Jergin & Son.....	Hempstead, Nassau Co.
A. N. Russell & Sons Co.....	Ilion, Herkimer Co.
Acme Wood Working Co., Inc., 514–516 W. 46th st.	New York, New York Co.
Ammann Mfg. & Const. Co., 155–163 Av D.	New York, New York Co.
C. W. Anderson, 449–451 W. 41st st.....	New York, New York Co.
Becker & Korb, 553 W. 35th st.....	New York, New York Co.
Bubeck & Guerin, Inc., 161–163 W. 18th st.	New York, New York Co.
Drosin Bros., 2076 Second av.....	New York, New York Co.
Louis R. Fisher, 227 Mercer st.....	New York, New York Co.
P. H. Gellman & Co., Wooster bet. Canal & Grand st.....	New York, New York Co.
Homckman Bros. & Co., 820 E. 5th st....	New York, New York Co.
Wm. Kleeman & Co., Inc., 101 Park av....	New York, New York Co.
Manhattan Office Partition Co., 143 Front st.	New York, New York Co.
Manhattan Show Case Co., 359 Canal st..	New York, New York Co.
Mount & Robertson, 41 Beaver st.....	New York, New York Co.
N. Y. Store Fixture Co., 9–11 E. 137th st..	New York, New York Co.
N. Y. Wood Working Corp., 506 E. 19th st.	New York, New York Co.
H. Pearlman, 858 Eighth av.....	New York, New York Co.
Queensboro Cabinet Co., 1110 First av....	New York, New York Co.
Ely J. Riesser & Co., Inc., 28th st. & First av.	New York, New York Co.
Charles R. Ross & Son, 12 Cedar st.....	New York, New York Co.
Wm. B. Rummler, 367–369 W. 11th st....	New York, New York Co.
Benj. Rybakoff, 229 E. 22d st.....	New York, New York Co.
Robert Wick Lumber Co., 556 W. 52d st..	New York, New York Co.
J. G. Wilson Corp.....	New York, New York Co.
Walker Bin Co.....	Penn Yan, Yates Co.
American Drafting Furniture Co.....	Rochester, Monroe Co.
Rochester Cabinet Co., Inc.....	Rochester, Monroe Co.
Rochester Show Case Works, 404 Platt st..	Rochester, Monroe Co.
Stromberg-Carlson Tel. Mfg. Co.....	Rochester, Monroe Co.
J. W. Storanit Mfg. Co.....	Rochester, Monroe Co.
E. M. Allewelt, 416 S. Salina st.....	Syracuse, Onondaga, Co.
Syracuse Show Case Works, 109 Decker st.	Syracuse, Onondaga Co.

Furniture

Auburn Prison	Auburn, Cayuga Co.
Kroehler Mfg. Co., Inc.	Binghamton, Broome Co.
Brooklyn Parlor Frame Co., Inc., 189–191 Wallabout st.	Brooklyn, Kings Co.
Colonial Mantel & Refrigerator Co., 494 Dumont av.	Brooklyn, Kings Co.
Casau–Thompson Co., 16 Ashland pl.	Brooklyn, Kings Co.
Gluck Bros., 38 Maujer st.	Brooklyn, Kings Co.
Manhattan Mantel Co., 55 Humboldt st.	Brooklyn, Kings Co.
National Parlor Suit Co., 71 Raymond st.	Brooklyn, Kings Co.
Romer Mfg. Co., Inc., 205–209 Deamond st.	Brooklyn, Kings Co.
Royal Table Co., 24 Boerum st.	Brooklyn, Kings Co.
Schneider & Sons, 156 19th st.	Brooklyn, Kings Co.
Schwartz & Co., 87–105 Richardson st.	Brooklyn, Kings Co.
Weber & Co., 5 LaGrange st.	Brooklyn, Kings Co.
Barcalo Mfg. Co., 225 Louisiana st.	Buffalo, Erie Co.
Board of Education	Buffalo, Erie Co.
C. M. Bott Furn. Co., 170 Leslie st.	Buffalo, Erie Co.
Buffalo Bed Spring Co.	Buffalo, Erie Co.
Buffalo Lounge Co.	Buffalo, Erie Co.
Cutler Desk Co., 20 Church st.	Buffalo, Erie Co.
Doll, Brown Co., Inc.	Buffalo, Erie Co.
Hersey & Co., 303 Ellicott st.	Buffalo, Erie Co.
Kittinger Co., Inc., 1893 Elmwood av.	Buffalo, Erie Co.
Pezold Furniture Co., 19 B st.	Buffalo, Erie Co.
Steul & Thuman Co.	Buffalo, Erie Co.
Frank S. Harden Co.	Camden, Oneida Co.
Louis Perin & Sons	Camden, Oneida Co.
Lee Chair Co.	Canastota, Madison Co.
Lenox Shops, Inc.	Canastota, Madison Co.
Oriental Furniture Co.	Canisteo, Steuben Co.
A. M. Zodansky	Cedarhurst, L. I., Nassau Co.
W. Hoffer Furniture Co., 180–182 Lancaster st.	Cohoes, Albany Co.
A. W. Hawley	Colton, St. Lawrence Co.
Cortland Cabinet Co.	Cortland, Cortland Co.
Cornell Table Co., Inc.	Earlville, Madison Co.
The Roycrofters	E. Aurora, Erie Co.
Stickley Mfg. Co.	Eastwood, Onondaga Co.
A. D. Morton	Eaton, Madison Co.
Elbridge Chair Co.	Elbridge, Onondaga Co.
Public Schools	Elmira, Chemung Co.
American Mfg. Concern	Falconer, Chautauqua Co.
C. W. Herrick Mfg. Co.	Falconer, Chautauqua Co.
Supreme Furniture Co.	Falconer, Chautauqua Co.
L. & J. G. Stickley, Inc.	Fayetteville, Onondaga Co.
A. & C. A. Hix	Fort Plain, Montgomery Co.

Doubleday, Page & Co	Garden City, Nassau Co.
Greene Mfg. Co	Greene, Chenango Co.
Koons Bros	Grooville, Sullivan Co.
Corona Typewriter Co	Groton, Tompkins Co.
F. E. Hale Mfg. Co	Herkimer, Herkimer Co.
Horrocks Desk Co	Herkimer, Herkimer Co.
National Desk Co	Herkimer, Herkimer Co.
Standard Furniture Co	Herkimer, Herkimer Co.
Wagner Furniture Co	Herkimer, Herkimer Co.
J. M. Deutsch Co	Hornell, Steuben Co.
F. L. Casper	Howe Cave, Schoharie Co.
Metropolitan Furniture House	Hudson, Columbia Co.
Traver & Cibulas	Hudson, Columbia Co.
Library Bureau	Ilion, Herkimer Co.
A. N. Russell & Sons Co	Ilion, Herkimer Co.
H. J. Bool Co	Ithaca, Tompkins Co.
Active Furniture Co	Jamestown, Chautauqua Co.
Advance Furniture Co	Jamestown, Chautauqua Co.
Alliance Furniture Co	Jamestown, Chautauqua Co.
Allied Furniture Co	Jamestown, Chautauqua Co.
The Anchor Furniture Co	Jamestown, Chautauqua Co.
Atlas Furniture Co	Jamestown, Chautauqua Co.
Bailey Table Co	Jamestown, Chautauqua Co.
C. W. Berrick Mfg. Co	Jamestown, Chautauqua Co.
Diamond Furniture Co	Jamestown, Chautauqua Co.
Elite Furniture Co	Jamestown, Chautauqua Co.
Empire Case Goods Co	Jamestown, Chautauqua Co.
Himebaugh Bros	Jamestown, Chautauqua Co.
Jamestown Lounge Co	Jamestown, Chautauqua Co.
Jamestown Period Furniture Co	Jamestown, Chautauqua Co.
Jamestown Table Co	Jamestown, Chautauqua Co.
Marvel Furniture Co	Jamestown, Chautauqua Co.
Monarch Furniture Co	Jamestown, Chautauqua Co.
Monitor Furniture Co	Jamestown, Chautauqua Co.
The A. C. Norquist Co	Jamestown, Chautauqua Co.
Paterniti Table Co	Jamestown, Chautauqua Co.
H. P. Robertson Co	Jamestown, Chautauqua Co.
Schulze & Van Stee Mfg. Co	Jamestown, Chautauqua Co.
Seaburg Mfg. Co	Jamestown, Chautauqua Co.
Shearman Bros. Co	Jamestown, Chautauqua Co.
Standard Table Co	Jamestown, Chautauqua Co.
The Star Furniture Co	Jamestown, Chautauqua Co.
Watson Mfg. Co	Jamestown, Chautauqua Co.
R. B. Prescott & Son, Inc	Keeseville, Essex Co.
Oneida Community, Ltd	Kenwood, Madison Co.
C. J. Lindstrom Mfg. Co	Little Falls, Herkimer Co.
Peter Duerr & Bros	Liverpool, Onondaga Co.
Charles Raupach	Liverpool, Onondaga Co.
Klein Bros	Long Is. City, Queens Co.
J. E. Haberer Furniture Co	Lowville, Lewis Co.

H. S. Wright	Madrid, St. Lawrence Co.
S. A. Cook & Co	Medina, Orleans Co.
Maher Bros. Co	Medina, Orleans Co.
Medina Wood Working & Furn. Co., Inc.	Medina, Orleans Co.
Niagara Furniture Co	Middleport, Niagara Co.
Giles & Giles Co	Middletown, Orange Co.
Charles J. Armstrong & Sons	Milford, Otsego Co.
W. S. Stevens	Moravia, Cayuga Co.
Hallagan–Thompson Co	Newark, Wayne Co.
American Parlor Frame Co., 499 Staff st.	New York, New York Co.
Wm. Baumgarten Co., 715 5th av	New York, New York Co.
Aug. Casiraghi, 725 First av	New York, New York Co.
Ernest Distelhorst, 522–524 E. 81st st	New York, New York Co.
Dubois Refrigerator Co., 107–111 W. 18th st.	New York, New York Co.
E. Eckenroth & Son, 921 E. 5th st	New York, New York Co.
Henry Fuldner & Sons, 404 E. 14th st	New York, New York Co.
John Helmsky, Inc., 637 W. 55th st	New York, New York Co.
Hofstatter's Sons, Inc., 362–372 Second av.	New York, New York Co.
H. F. Huber & Co., 627 E. 18th st	New York, New York Co.
L. H. Mace & Co., Inc., 55 E. 150th st	New York, New York Co.
Manhattan Table Mfg. Corp., 34–47 Broome st.	New York, New York Co.
W. F. Metz, 152 Av. D	New York, New York Co.
The Nahon Co., 53d st. & E. River	New York, New York Co.
National Parlor Frame Co	New York, New York Co.
New York Couch Frame Co., 652 E. 12th st	New York, New York Co.
Palmer & Embury Mfg. Co., 9 Gouverneur Slip	New York, New York Co.
M. Reischmann & Sons, 135th st. & Willow av.	New York, New York Co.
M. Reischmann & Sons, Inc., 138 Willow av.	New York, New York Co.
Richter Furniture Co., 521 E. 72d st	New York, New York Co.
Theodore Sauer Co., 417 E. 47th st	New York, New York Co.
Schilling Bros. Table Co., Inc., 631 E. 16th st	New York, New York Co.
Schloss Bros, Inc., 637 W. 55th st	New York, New York Co.
Schmeig & Co., 521 E. 72d st	New York, New York Co.
Skrivanek & Tannhauser, 1110 First av	New York, New York Co.
Philip Strobel & Sons, Inc., 53 Elizabeth st.	New York, New York Co.
F. Vogel & Co., 222 E. 37th st	New York, New York Co.
S. W. Johnson & Son	Nichols, Tioga Co.
Indian River Mfg. Co	Philadelphia, Jefferson Co.
Salmon River Table Co	Pulaski, Oswego Co.
Seneca Furniture Corp	Randolph, Cattaraugus Co.
Curtiss Bros	Richland, Oswego Co.
American Drafting Furniture Co	Rochester, Monroe Co.
The Hayden Co	Rochester, Monroe Co.
Langslow–Fowler Co	Rochester, Monroe Co.
C. M. Lenhard, 21 Weicher st	Rochester, Monroe Co.
George J. Michelson Furn. Co	Rochester, Monroe Co.
Miller Cabinet Co	Rochester, Monroe Co.
H. P. Sickles Co., 840 University av	Rochester, Monroe Co.
Yawman & Erbe Mfg. Co	Rochester, Monroe Co.
Roscoe Ten Pin Co	Roscoe, Sullivan Co.

Fancher Furniture Co..... Salamanca, Cattaraugus Co.
Sterling Furniture Co..... Salamanca, Cattaraugus Co.
Schenectady Public Schools..... Schenectady, Schenectady Co.
Fulton Furniture Co., Inc..... Shandaken, Ulster Co.
H. J. Montgomery Mfg. Co..... Silver Creek, Chautauqua Co.
The Schoeck Mfg. Co..... Skaneateles, Onondaga Co.
Norton & Mitchell ..... Sodus, Wayne Co.
Henry Salzler Co..... Springville, Erie Co.
Erskine-Danforth Corp..... (Stamford, Fairfield Co., Conn.)
Butler Mfg. Co..... Syracuse, Onondaga Co.
H. Doetsch, 708 Hickory st..... Syracuse, Onondaga Co.
Kronen & Beehner, 101 E. Willow st..... Syracuse, Onondaga Co.
Quaint Art Furniture Co..... Syracuse, Onondaga Co.
Elgin A. Simonds Co., 717 Clinton st..... Syracuse, Onondaga Co.

Bryant Furniture Co..... Truxton, Cortland Co.
T. D. Wadelton ..... Tuckahoe, Westchester Co.

Board of Education ..... Utica, Oneida Co.

Hall & Lyon Furniture Co..... Waverly, Tioga Co.
Plail Bros ..... Wayland, Steuben Co.
Telescope Cot & Novelty Works..... West Pike, Potter Co., Pa.
Quigley Furniture Co..... Whitesboro, Oneida Co.
W. S. Allen ..... Whitney Point, Broome Co.

Handles

The J. S. Harrison Co..... Addison, Steuben Co.
Gardner Brown Co..... Amsterdam, Montgomery Co.
Pioneer Broom Co., Inc..... Amsterdam, Montgomery Co.
Sacandaga River Land & Lumber Co..... Amsterdam, Montgomery Co.
Cady Mfg. Co..... Auburn, Cayuga Co.

Henry V. Watkins..... Bellport, Suffolk Co.
P. E. Kennehan Son & Co..... Brasher Falls, St. Lawrence Co.
Cadosia Mfg. Co..... Cadosia, Delaware Co.
E. Q. Dutton & Co..... Cato, Cayuga Co.
S. Roberts ..... Chester, Orange Co.

Dwight, Divine & Sons ..... Ellenville, Ulster Co.

Union Fork & Hoe Co..... Frankfort, Herkimer Co.

Ellis & Smith ..... Gloversville, Fulton Co.

H. A. Williams ..... Hancock, Delaware Co.

Herbert Brush Mfg. Co..... Kingston, Ulster Co.

H. Cheney Hammer Corp..... Little Falls, Herkimer Co.
Henry Peak ..... Long Eddy, Sullivan Co.

H. R. Greenman ..... McGraw, Cortland Co.
Margaretville Handle Co ..... Margaretville, Delaware Co.

New York Knife Co., 225 Fifth av ..... New York, New York Co.
North Creek Mfg. Co., Inc ..... North Creek, Warren Co.
Woodworth Knife Works ..... Nunda, Livingston Co.

The Jennings & Griffin Mfg. Co ..... Port Jervis, Orange Co.

Edgar W. Cornius ..... Redfield, Oswego Co.
Mack & Co ..... Rochester, Monroe Co.
W. D. Blasier ..... Rome, Oneida Co.

Salem Mfg. Co ..... Salem, Washington Co.
Lehentaler Bros ..... Saratoga Springs, Saratoga Co.
E. J. Tuthill ..... Stokes, Oneida Co.
C. C. Bradley & Son ..... Syracuse, Onondaga Co.

Tie Co ..... Unadilla, Otsego Co.

Laundry Appliances

Blackstone Mfg. Co ..... Jamestown, Chautauqua Co.
Lestershire Lumber & Box Co ..... Johnson City, Broome Co.

General Railway Signal Co ..... Rochester, Monroe Co.

Syracuse Washer Corp ..... Syracuse, Onondaga Co.

Cluett, Peabody & Co., Inc ..... Troy, Rensselaer Co.

Machine Construction

John McCarthy ..... Albion, Orleans Co.
Isham Mfg. Co ..... Avon, Livingston Co.

W. G. Case & Co ..... Black River, Jefferson Co.
McDonell & Brennen ..... Bolivar, Allegany Co.
Union Loom Works, Inc ..... Booneville, Oneida Co.
Buffalo Pitts Co., 27 Carolina st ..... Buffalo, Erie Co.

Alphonso Walrath Co ..... Fort Plain, Montgomery Co.
Acme Road Machinery Co ..... Frankfort, Herkimer Co.

American Road Machinery Co ..... Groton, Tompkins Co.

Hillsdale Plow Co ..... Hillsdale, Columbia Co.
Noble & Wood Machinery Co ..... Hoosick Falls, Rensselaer Co.
Gifford Wood Co ..... Hudson, Columbia Co.

Williams Bros ..... Ithaca, Tompkins Co.

Universal Road Machinery Co ..... Kingston, Ulster Co.

Hall Iron Works..... Lockport, Niagara Co.
William C. Aul ..... Lyons, Wayne Co.

American Road Machinery Co..... Marathon, Cortland Co.
Bradney Machine Co..... Middletown, Orange Co.
Shepard Electric Crane & Hoist Co..... Montour Falls, Schuyler Co.
Linn Mfg. Corp..... Morris, Otsego Co.

Ireland Machine & Foundry Co..... Norwich, Chenango Co.

American Laundry Machine Co..... Rochester, Monroe Co.

Huntley Mfg. Co..... Silver Creek, Chautauqua Co.
Invincible Grain Cleaner Co..... Silver Creek, Chautauqua Co.
Staats Ice Tool Works..... Staatsburg, Dutchess Co.
Boomer & Boschert Press Co., 329 Water st. Syracuse, Onondaga Co.
Engelberg Huller Co..... Syracuse, Onondaga Co.

Walton Foundry Co..... Walton, Delaware Co.

Matches

Northern Match Splint Co., Inc..... Constantia, Oswego Co.

The Diamond Match Co..... Oswego, Oswego Co.
Northern Match Splint Co., Inc..... Oswego, Oswego Co.

Motor Vehicles

Wm. L. Schupp & Sons..... Albany, Albany Co.
Seim & Reissig..... Albany, Albany Co.
Horton Lumber Co..... Altmar, Oswego Co.
Geo. C. Broadbooks Co., Inc..... Attica, Wyoming Co.
Eagle Wagon Works..... Auburn, Cayuga Co.

Henry D. Jackson..... Beacon, Dutchess Co.
Peattie Bros..... Beacon, Dutchess Co.
Larrabee–Deyo Motor Truck Co., Inc..... Binghamton, Broome Co.
Borden's Farm Products Co., Inc., 992 Gates av..... Brooklyn, Kings Co.
A. Kreinbrink & Co., 46 Bergen st..... Brooklyn, Kings Co.
Thos. Rockford, 1066 Bedford av..... Brooklyn, Kings Co.
Shadbolt Mfg. Co., 68–78 Flushing av.... Brooklyn, Kings Co.
J. A. Shephard & Son, Atlantic & Fountain av..... Brooklyn, Kings Co.
American Body Co., 1200 Niagara st..... Buffalo, Erie Co.
Atterbury Motor Corp, Elmwood & Hertel av..... Buffalo, Erie Co.
Buffalo Body Corp, 838 Seneca st..... Buffalo, Erie Co.
Buffalo Wagon Works, 111–115 Carroll st. Buffalo, Erie Co.
J. Christensen, 635 Genesee st..... Buffalo, Erie Co.
E. A. Cook Wagon Co..... Buffalo, Erie Co.
The Thomas Derry Co., Inc., 466 Vermont st..... Buffalo, Erie Co.
Harvey Top & Body Co., 918 Main st..... Buffalo, Erie Co.
Hill Mfg. Co., 27 Fuller st..... Buffalo, Erie Co.

Henry Landsheft, 1202 Jefferson st	Buffalo, Erie Co.
Meyer Wagon Works, 216 Elm st	Buffalo, Erie Co.
Pierce–Arrow Motor Car Co., 1695 Elmwood av	Buffalo, Erie Co.
Watkins Commercial Body Corp, 666–668 Genesee st	Buffalo, Erie Co.
Wurster Wagon Works, 314 Seneca st	Buffalo, Erie Co.
The Brewer–Titchener Corp	Cortland, Cortland Co.
Brockway Motor Truck Co	Cortland, Cortland Co.
James B. Hunt	Cortland, Cortland Co.
W. F. Smith	Dansville, Livingston Co.
Mulholland Co	Dunkirk, Chautauqua Co.
H. L. Post	Farmingdale, Nassau Co.
Geneva Wagon Co	Geneva, Ontario Co.
B. Braun	Hempstead, Nassau Co.
D. H. Starr	Highland, Ulster Co.
J. T. Cantrell & Co	Huntington, Suffolk Co.
Brewster & Co	Long Island City, Queens Co.
Washington Taylor	Mt. Vernon, Westchester Co.
Wayne Wheel Co	Newark, Wayne Co.
Arthur Colvill	Newburgh, Orange Co.
Demarest & Co., Inc., 521 E. 72d st	New York, New York Co.
Earnest Distethorst & Co., 522–524 E. 81st st	New York, New York Co.
Healey & Co., 1622 Broadway	New York, New York Co.
S. Katsur Co., 1161 First av	New York, New York Co.
Wm. Koenig, 24 St. Lawrence st	New York, New York Co.
J. Kramer & Sons Mfg. Co., 673–679 Water st	New York, New York Co.
Liberty Wagon Works, 540 W. 40th st	New York, New York Co.
Chas. Scheidler Est., 352 W. 53d st	New York, New York Co.
Sebastian Wagon Co., 422 E. 54th st	New York, New York Co.
J. A. Shephard & Son, Atlantic & Fountain av	New York, New York Co.
John Theurer Wagon Works, 609–615 W. 56th st	New York, New York Co.
Niagara Motor Boat Co	No. Tonawanda, Niagara Co.
August Schubert Wagon Co	Oneida, Madison Co.
Champion Wagon Works	Owego, Tioga Co.
A. L. Cole	Owego, Tioga Co.
Pouvailsmith Corp	Poughkeepsie, Dutchess Co.
W. H. & J. T. Callister	Queens, Queens Co.
Caley & Nash, Inc., 1828 East av	Rochester, Monroe Co.
James Cunningham Son & Co., 13 Canal st	Rochester, Monroe Co.
Dousing & Zieres	Rochester, Monroe Co.
Rochester Carriage Co., 1701 East av	Rochester, Monroe Co.

W. H. Rowedink, 80 North st..... Rochester, Monroe Co.
Seldon Motor Vehicle Co..... Rochester, Monroe Co.
A. F. Stewart..... Rochester, Monroe Co.

Cortland Cart & Carriage Co..... Sidney, Delaware Co.
W. H. Webier..... Sodus Center, Wayne Co.
H. H. Franklin Mfg. Co..... Syracuse, Onondaga Co.
L. Vaeth Sons, 332 S. West st..... Syracuse, Onondaga Co.

National Body Corp..... Tarrytown, Westchester Co.
Jos. J. LeCompte..... Troy, Rensselaer Co.
Chas. J. Vannier..... Troy, Rensselaer Co.

Bailey & Bowie..... Utica, Oneida Co.
Willoughby Co..... Utica, Oneida Co.

Waterloo Wagon Co..... Waterloo, Seneca Co.
H. H. Babcock Co..... Watertown, Jefferson Co.
Chas. G. Richenecker..... Watervliet, Albany Co.

Musical Instruments

Sohmer & Co., Jamaica av. & Boulevard.. Astoria, L. I., Queens Co.

French Cabinet Corp., Metropolitan av... Brooklyn, Kings Co.
Jordan Cabinet Wks., Inc., 129 Degraw st. Brooklyn, Kings Co.
Reuben Midmer & Son, Inc., 375 Fulton st. Brooklyn, Kings Co.
Otto Wissner, Inc., 1072–1108 Atlantic av. Brooklyn, Kings Co.
C. Kurtzmann Co., 526 Niagara st..... Buffalo, Erie Co.
Viner & Son, 1375 Niagara st..... Buffalo, Erie Co.

George Lahm ..... Callicoon, Sullivan Co.
A. C. Cheney Piano Action Co..... Castleton, Rensselaer Co.
N. T. Manufacturing Co..... Cohoes, Albany Co.

J. Breckwoldt & Co..... Dolgeville, Herkimer Co.
George Loucks ..... Dolgeville, Herkimer Co.

Foster–Armstrong Co..... East Rochester, Monroe Co.

Jamestown Mantel Co..... Falconer, Chautauqua Co.
Merriam Cabinet Co., Inc..... Falconer, Chautauqua Co.

Auto Phone Co..... Ithaca, Tompkins Co.

Ahlstrom Piano Co..... Jamestown, Chautauqua Co.
Level Furniture Co..... Jamestown, Chautauqua Co.

C. J. Lindstrom Mfg. Co..... Little Falls, Herkimer Co.
Jos. N. Courtade & Sons, Inc., Webster & 8th av..... Long Island City, Queens Co.
Steinway & Sons, Riker av. & Blackwell st. Long Island City, Queens Co.

Reuben Midmer & Son, Inc..... Merrick, Nassau Co.
Mount Kisco Woodworking Co..... Mount Kisco, Westchester Co.

Grubb & Kosegarten Bros.	Nassau, Rensselaer Co.
Aimone Mfg. Co., 430 E. 23d st.	New York, New York Co.
Autotone Co., 433 5th av.	New York, New York Co.
Biddle Piano Co., 107 E. 128th st.	New York, New York Co.
Christman Piano Co., 597 E. 137th st.	New York, New York Co.
Jacob Doll & Sons, 100 Southern blvd.	New York, New York Co.
Esty Piano Co., 112 Lincoln av.	New York, New York Co.
Hardman, Peck & Co., 433 5th av.	New York, New York Co.
E. G. Harrington Co., 433 5th av.	New York, New York Co.
Kindler & Collins, 520 W. 48th st.	New York, New York Co.
Kohler Industries, 601 W. 50th st.	New York, New York Co.
Krakauer Bros., 191 Cypress av.	New York, New York Co.
Kranich & Bach, 235 E. 23d st.	New York, New York Co.
The Laffargue Co., 134th st. & S. blvd.	New York, New York Co.
Ludwig & Co., 748 E. 136th st.	New York, New York Co.
Paul G. Mehlin & Sons, 27 Union Square.	New York, New York Co.
J. H. & C. S. O'Dell Co., 407 W. 42d st.	New York, New York Co.
Ricca & Son, 99 Southern blvd.	New York, New York Co.
The Schubert Piano Co., 1 W. 139th st.	New York, New York Co.
The Staib-Abendschein Co., 500 E. 134th st.	New York, New York Co.
Standard Pneumatic Action Co., 638 W. 52d st.	New York, New York Co.
Strauch Bros., Inc., 30 W. 10th av.	New York, New York Co.
Stultz & Bauer, 338–340 E. 31st st.	New York, New York Co.
Wessel, Nickel & Gross, 457 W. 45th st.	New York, New York Co.
North Tonawanda Musical Instrument Works	N. Tonawanda, Niagara Co.
The Rudolph Wurlitzer Mfg. Co.	N. Tonawanda, Niagara Co.
Ben Ferrara	Oneida, Madison Co.
Charmaphone Co.	Pulaski, Oswego Co.
Fred Englehardt Piano Co.	St. Johnsville, Montgomery Co.
The Amphion Co., 618 N. Clinton st.	Syracuse, Onondaga Co.
Pullman Bros.	Thendara, Herkimer Co.
Century Cabinet Co.	Utica, Oneida Co.
C. E. Morey	Utica, Oneida Co.
Marr & Colton Co.	Warsaw, Wyoming Co.

Patterns and Flasks

Westinghouse Elec. Mfg. Co.	Attica, Wyoming Co.
Morris Machine Works	Baldwinsville, Onondaga Co.
Dutchess Tool Co.	Beacon, Dutchess Co.
Foster Pump Works, 36 Bridge st.	Brooklyn, Kings Co.
American Radiator Co.	Buffalo, Erie Co.
Bingham Taylor	Buffalo, Erie Co.
Board of Education	Buffalo, Erie Co.
Buffalo Pattern Works, Inc., 830 Hertel av.	Buffalo, Erie Co.

Buffalo Pitts Co., 27 Carolina st	Buffalo, Erie Co.
W. A. Case & Son Mfg. Co., 174 Kensington av.	Buffalo, Erie Co.
F. A. Colson Pattern Works, 89 Main st	Buffalo, Erie Co.
Otis Elevator Co	Buffalo, Erie Co.
Peerless Pattern Works, 1139 Main st	Buffalo, Erie Co.
Pierce Arrow Motor Car Co., 1695 Elmwood av.	Buffalo, Erie Co.
American Locomotive Co	Dunkirk, Chautauqua Co.
Atlas Crucible Steel Co	Dunkirk, Chautauqua Co.
Continental Heater Co	Dunkirk, Chautauqua Co.
Pierce Butler & Pierce	Eastwood, Onondaga Co.
Public Schools	Elmira, Chemung Co.
Silts Machine Shop	Fulton, Oswego Co.
J. H. Newbury & Son	Goshen, Orange Co.
Gowanda Agr. Works	Gowanda, Cattaraugus Co.
American Road Machinery Co	Groton, Tompkins Co.
Groton Bridge Co	Groton, Tompkins Co.
Guilderland Foundry Co	Guilderland, Albany Co.
Hilsdale Plow Co	Hillsdale, Columbia Co.
Gifford Wood Co	Hudson, Columbia Co.
Lackawanna Steel Co	Lackawanna, Erie Co.
American Malleable Co	Lancaster, Erie Co.
Lock City Pattern & Mach. Co	Lockport, Niagara Co.
Trevor Mfg. Co	Lockport, Niagara Co.
S. Cheney & Sons	Manlius, Onondaga Co.
N. Y. C. & W. R. R. Co	Middletown, Orange Co.
Shepard Electric Crane & Hoist Co	Montour Falls, Schuyler Co.
R. J. & T. H. Stuart	New Hamburg, Dutchess Co.
De La Vergne Machine Co., ft. of l. 138th st.	New York, New York Co.
Ames Iron Works	Oswego, Oswego Co.
Corning Foundry, Inc	Painted Post, Steuben Co.
Painted Post Development Co	Painted Post, Steuben Co.
The Garlock Packing Co	Palmyra, Wayne Co.
Bayles Shipyard, Inc	Port Jefferson, Suffolk Co.
American Laundry Machine Co	Rochester, Monroe Co.
Co-operative Foundry Co	Rochester, Monroe Co.
Gen. Railway Signal Co	Rochester, Monroe Co.
National Car Wheel Co	Rochester, Monroe Co.
The T. H. Symington Co	Rochester, Monroe Co.
American Locomotive Works	Schenectady, Schenectady Co.
Gen. Electric Co	Schenectady, Schenectady Co.

Huntley Mfg. Co	Silver Creek, Chautauqua Co.
Halcomb Steel Co., Geddes st	Syracuse, Onondaga Co.
Engeiberg Huller Co	Syracuse, Onondaga Co.
Syracuse Pattern Works, Inc., 107 N. Franklin st	Syracuse, Onondaga Co.
The Straight Line Engine Co	Syracuse, Onondaga Co.
Bascom Pattern Works	Troy, Rensselaer Co.
Cluett, Peabody & Co., Inc	Troy, Rensselaer Co.
Ross Pattern Works	Troy, Rensselaer Co.
Board of Education, Manual Training	Utica, Oneida Co.
Rider-Ericsson Engine Co	Walden, Orange Co.
George B. Mentz Co	Wallkill, Ulster Co.
Otis Elevator Co	Yonkers, Westchester Co.
Saunders Trades School	Yonkers, Westchester Co.

Picture Frames and Moldings

Empire Moulding Co., 391 Leonard st	Brooklyn, Kings Co.
Gottl-Weber Co., 5 La Grange st	Brooklyn, Kings Co.
Greenpoint Moulding Co., Cuyler, Newell & Diamond sts	Brooklyn, Kings Co.
Greenpoint Picture Frame Works, 106 Franklin st	Brooklyn, Kings Co.
National Mldg. Co., 39th st. & 2d av	Brooklyn, Kings Co.
C. H. Pearson, Co., 34 Lorimer St	Brooklyn, Kings Co.
Union Mill Co., 2d av., Cor. 8th st	Brooklyn, Kings Co.
Mullin, Wagner & Co	Coney Island, Kings Co.
Oliver Jackson	Greenwood, Steuben Co.
J. Borowsky, Inc., 146 Ave. D	New York, New York Co.
E. A. Gillespie, Ozone Park	New York, New York Co.
Lippi & Co., 328 E. 26th st	New York, New York Co.
D. Milch, 131 W. 41st st	New York, New York Co.
N. Y. Carved Mldg. Co., 139th st. & 3d av.	New York, New York Co.
F. J. Newcomb Mfg. Co., 44 W. 13th st	New York, New York Co.
Nonnenback & Co., 102 Mulberry st	New York, New York Co.
S. & R. Frame Co., 213 4th av	New York, New York Co.
Ullman Mfg. Co., 338 E. 59th st	New York, New York Co.
Unionport Woodworking Co., Westchester av. & White Plassis rd	New York, New York Co.
Zubrinsky Mldg. Mfg. Co., 1 E. Bway	New York, New York Co.
J. W. Gillis Co	Rochester, Monroe Co.
N. L. Lockhart Co., 100 S. Fitzhugh st	Rochester, Monroe Co.
Rochester Moulding Wks., Inc	Rochester, Monroe Co.
E. M. Klock & Sons, 1962 W. Fayette st	Syracuse, Onondaga Co.
P. B. & H. Moulding Co	Syracuse, Onondaga Co.

Planing Mill Products

F. E. Wright & Co..... Adams, Putnam Co.
William Smith ..... Addison, Steuben Co.
Albany Lumber & Planing Mill Co., Inc... Albany, Albany Co.
Carl W. Savage..... Alden, Erie Co.
Hutchinson Bros. ..... Alexandria Bay, Jefferson Co.
E. F. Smith..... Allegany, Cattaraugus Co.
Fred E. Purdy ..... Altona, Clinton Co.
Milford H. Ketcham ..... Amityville, Suffolk Co.
Andover Heading Co..... Andover, Allegany Co.
J. E. Baker ..... Angola, Erie Co.
Geo. D. Bethel ..... Antwerp, Jefferson Co.
Frank Palmer & Sons..... Apalachin, Tioga Co.
Elmer E. Spencer..... Arcade, Wyoming Co.
Green Bros. ..... Ashville, Chautauqua Co.
Wesley Ranger ..... Attica, Wyoming Co.
John L. Alnutt..... Auburn, Cayuga Co.

W. R. Prouty ..... Bainbridge, Chenango Co.
Charles Baker ..... Bakers Mills, Warren Co.
L. C. Lum..... Barker, Niagara Co.
Charles P. Emerson ..... Bath, Steuben Co.
A. B. Wier ..... Belfast, Allegany Co.
Armstrong & Piermann ..... Bellport, L. I., Suffolk Co.
Bartlett & Co..... Binghamton, Broome Co.
John L. Lewis ..... Binghamton, Broome Co.
Ed. & Wm. Van Antwerp..... Binghamton, Broome Co.
Russell L. Merwin..... Blue Mt. Lake, Hamilton Co.
F. M. Hoy ..... Brainardsville, Franklin Co.
Charles Vail ..... Broadalbin, Fulton Co.
Louis Bossert & Sons, Inc., 1335 Grand st. Brooklyn, Kings Co.
Cross, Austin & Ireland, 1246 Grand st.... Brooklyn, Kings Co.
H. F. Gumninau, 118 Montauk av..... Brooklyn, Kings Co.
Johnson Bros., 45 Classon av..... Brooklyn, Kings Co.
Jacob Morganthaler & Son, 663 Sackett st. Brooklyn, Kings Co.
E. C. Smith, 420 Oakland st..... Brooklyn, Kings Co.
Herman Vossnack, Jr., Inc., 128 Fulton st. Brooklyn, Kings Co.
Greene's Planing Mill..... Brushton, Franklin Co.
Behringer Bros., Inc., 167 Imson st..... Buffalo, Erie Co.
Charles Boller & Sons Co..... Buffalo, Erie Co.
G. Elias & Bro., Inc..... Buffalo, Erie Co.
Christian Flierl Co., Inc., 1352 Genesee st. Buffalo, Erie Co.
E. M. Hager & Sons Co., 141 Elm st..... Buffalo, Erie Co.
Hurd Bros., 719 Bailey av..... Buffalo, Erie Co.
John Hutzler Lbr. Co., Inc., 1670–1682 Genesee st. ..... Buffalo, Erie Co.
McNeil Lumber Corp., 1767 Fillmore av.. Buffalo, Erie Co.
Montgomery Bros. Co., Court & Wilkinson sts. ..... Buffalo, Erie Co.
William Neubecker, 243 French st..... Buffalo, Erie Co.
Stokes Bros., 50 Brayton st..... Buffalo, Erie Co.
L. N. Whissel Lumber Corp., 577–615 Cambridge st. ..... Buffalo, Erie Co.
Irving Dunham ..... Burdett, Schuyler Co.

Henderson Lumber Co.	Caledonia, Livingston Co.
Charles A. McGhee	Cambridge, Washington Co.
George W. Dana	Camden, Oneida Co.
J. A. Scobell Estate	Cape Vincent, Jefferson Co.
Grant Brown	Carlisle, Schoharie Co.
Elitsac Mfg. Co	Castile, Wyoming Co.
C. L. Sancomb	Chateaugay, Franklin Co.
Clymer Lumber Co	Clymer, Chautauqua Co.
State Shop	Cohoes, Albany Co.
Kraemer Bros. Co	College Pt., L. I., Suffolk Co.
Johengen, Johnson & Schmitz	Collins Center, Erie Co.
White & Vogel	Comstock, Washington Co.
Emporium Forestry Co	Conifer, St. Lawrence Co.
The Steam Mill Co	Constableville, Lewis Co.
Joseph P. Brady	Cooperstown, Otsego Co.
H. R. Taylor Corp	Cornwall, Orange Co.
Croghan Flooring & Mfg. Co., Inc	Croghan, Lewis Co.
Benj F. Zehr	Croghan, Lewis Co.
Geo. Jungst & Son	Croton Falls, Westchester Co.
J. W. Phillips	Crown Point, Essex Co.
J. E. Pond & Son	Crown Point, Essex Co.
Phelps & Sibley	Cuba, Allegany Co.
John G. Fontaine	Dansville, Livingston Co.
Deposit Lumber Co	Deposit, Broome Co.
Atlas Crucible Steel Co	Dunkirk, Chautauqua Co.
Dunkirk Lumber & Coal Co	Dunkirk, Chautauqua Co.
Madigan Lumber Co	Dunkirk, Chautauqua Co.
Zine Lumber Co	East Aurora, Erie Co.
A. A. Stewart	East Randolph, Cattaraugus Co.
H. T. Gumtow	Eden, Erie Co.
Rust & Olin	Ellicottville, Cattaraugus Co.
The Doane & Jones Lumber Co	Elmira, Chemung Co.
William Schonckle	Far Rockaway, Queens Co.
Crosby Kelly	Fleischmanns, Delaware Co.
H. V. Berry	Fort Plain, Montgomery Co.
Empire Mfg. Co	Franklinville, Cattaraugus Co.
Luke & Bouquin	Fredonia, Chautauqua Co.
R. J. Rogers Lumber Co	Geneva, Ontario Co.
Rivenburg Bros	Germantown, Columbia Co.
C. F. Bushnell	Gilbertsville, Otsego Co.
W. G. Riffanacht	Glenfield, Lewis Co.
Finch Pruyn & Co	Glens Falls, Warren Co.
Burr Lumber Co	Gloversville, Fulton Co.
Holden Lumber Co	Gloversville, Fulton Co.
Forbush Planing Mills Co	Gowanda, Cattaraugus Co.
Fred Potter	Granville, Washington Co.
Lyon Iron Works	Greene, Chenango Co.
Hamburg Planing Mill Co	Hamburg, Erie Co.
R. A. Kilbourne & Son	Harrisville, Lewis Co.

C. R. Snell & Sons ..... Herkimer, Herkimer Co.
West Canada Lumber Co ..... Herkimer, Herkimer Co.
Griffin Lumber Co ..... Hudson Falls, Washington Co.
Kenyon Lumber Co ..... Hudson Falls, Washington Co.

Conrad Clipper ..... Ilion, Herkimer Co.

Oneida Community, Ltd ..... Kenwood, Madison Co.

The Blount Lumber Co ..... Lacona, Oswego Co.
George R. Russell ..... Lake George, Warren Co.
A. E. Paye ..... Lake Kushaqua, Franklin Co.
Lake Placid Co ..... Lake Placid Club, Essex Co.
R. C. Rogers ..... Le Roy, Genesee Co.
A. Little & Son ..... Little Falls, Herkimer Co.
Livingston Manor Lumber Co ..... Livingston Manor, Sullivan Co.
The Courcot Co., Inc ..... Mallory, Oswego Co.
Charles Boadway ..... Malone, Franklin Co.
John Kelley ..... Malone, Franklin Co.
Malone Knitting Co ..... Malone, Franklin Co.
Malone Lumber Co ..... Malone, Franklin Co.
Charles Garsch Sons ..... Margaretville, Delaware Co.
Margaretville Planing Mill Co ..... Margaretville, Delaware Co.
W. L. Pratt ..... Massena, St. Lawrence Co.
Mrs. J. K. Ames ..... Mexico, Oswego Co.
Thomas Rush ..... Middleburg, Schoharie Co.
H. F. Vogel ..... Middle Granville, Washington Co.
Giles & Giles Co ..... Middletown, Orange Co.
Tyrell & Kinner ..... Middletown, Orange Co.
Charles J. Armstrong & Sons ..... Milford, Otsego Co.
Witherbee, Sherman & Co., Inc ..... Mineville, Essex Co.
Isaac Smith ..... Monticello, Sullivan Co.
Stephen Trowbridge ..... Monticello, Sullivan Co.
Harry Washington ..... Monticello, Sullivan Co.
Mt. Kisco Bldg. Supply Co ..... Mount Kisco, Westchester Co.
The Wilson & Adams Co ..... Mount Vernon, Westchester Co.
E. H. Pierce ..... Naples, Ontario Co.
Manning Reddant ..... Naples, Ontario Co.
J. M. Slayton ..... Naples, Ontario Co.
John S. Ness & Son ..... Narrowsburg, Sullivan Co.
Newfane Lumber & Mfg. Co ..... Newfane, Niagara Co.
Dunbar Box & Lumber Co., 282 Eleventh av. New York, New York Co.
East Side Planing Mill, 514 First av ..... New York, New York Co.
F. Eckenroth & Son, 921 E. 5th st ..... New York, New York Co.
Jacob Gangnagel, 801 Mutual Life Bldg.. New York, New York Co.
Church E. Gates & Co., 152d & East River New York, New York Co.
Hasbrouck Flg. Co., 501–509 East 70th st. New York, New York Co.
G. W. Koch & Son, 9 E. 40th st ..... New York, New York Co.
James McBride Flg. Co., 169 Lincoln av... New York, New York Co.
Charles A. Pope, 320 E. 95th st ..... New York, New York Co.
J. M. Saulpaugh Sons, 705 E. 11th st.... New York, New York Co.
Gorham F. Smith, 301 Eleventh av ..... New York, New York Co.

Wright Lumber Co., Inc., 148 W. 38th st.	New York, New York Co.
Wm. P. Youngs & Bro., 735 E. 9th st.	New York, New York Co.
Allen Smith Co.	Niagara Falls, Niagara Co.
S. W. Johnson & Son	Nichols, Tioga Co.
W. H. Plumb & Son	North Bangor, Franklin Co.
C. P. Falk	North Collins, Erie Co.
The R. T. Jones Lumber Co	No. Tonawanda, Niagara Co.
King Construction Co.	No. Tonawanda, Niagara Co.
George C. Meyers	No. Tonawanda, Niagara Co.
Northern Lumber Co	No. Tonawanda, Niagara Co.
W. G. Palmer, Inc.	No. Tonawanda, Niagara Co.
Thompson–Hubman–Fisher	No. Tonawanda, Niagara Co.
J. E. Wallace	No. Tonawanda, Niagara Co.
White–Gratwick–Mitchell	No. Tonawanda, Niagara Co.
The Sacandaga River Land & Lumber Co.	Northville, Fulton Co.
Charles Winters	North White Lake, Sullivan Co.
E. J. Elliott	Norwich, Chenango Co.
N. F. Dewitt	Odessa, Schuyler Co.
Proctor Manufacturing Co	Ogdensburg, St. Lawrence Co.
Skillings, Whitneys & Barnes Lbr. Co., Inc.	Ogdensburg, St. Lawrence Co.
W. D. Butler	Oneonta, Otsego Co.
McFee & Borst	Oneonta, Otsego Co.
A. E. Norton	Oriskany Falls, Oneida Co.
J. E. Jones	Owego, Tioga Co.
A. Paine & Son	Owego, Tioga Co.
Post & Henderson	Owego, Tioga Co.
L. B. Truman	Owego, Tioga Co.
Frank C. Miller	Parish, Oswego Co.
Plattsburg Lumber Co	Plattsburg, Clinton Co.
Port Chester Lumber Co	Port Chester, Westchester Co.
The A. Sherman Lumber Co	Potsdam, St. Lawrence Co.
Charles Garrison	Ripley, Chautauqua Co.
William G. Bell, 962 Main st. E.	Rochester, Monroe Co.
Rochester Parquet Floor Co	Rochester, Monroe Co.
Peter Zielinski	Rochester, Monroe Co.
S. N. Skinner	Rockdale, Chenango Co.
William Cooper & Son	Rushford, Allegany Co.
George H. Cleveland	Sag Harbor, Suffolk Co.
Clark H. Burkdorf	St. Johnsville, Montgomery Co.
John H. Kneeskern & Sons	St. Johnsville, Montgomery Co.
A. Sponable	St. Johnsville, Montgomery Co.
G. F. Miller & Son	Salamanca, Cattaraugus Co.
Branch Gallahan	Saranac Lake, Franklin Co.
Seymour Ruggles	Saratoga Spgs., Saratoga Co.
J. B. Pierce	Schenectady, Schenectady Co.
Funston Bros.	Schuylerville, Saratoga Co.
Thomas Nevins	Schuylerville, Saratoga Co.
The Lyon Washington Lumber Co.	Sherman, Chautauqua Co.
Hooker & Higgs	Sinclairville, Chautauqua Co.
L. C. Bowen	Skerry, Franklin Co.
Charles Coonley	Slingerlands, Albany Co.

Lyons Mills ..... Solsville, Madison Co.
Fred A. Olmstead ..... So. Fallsburgh, Sullivan Co.
Frank H. Stuart ..... Springwater, Livingston Co.
H. S. Farrell ..... Staten Island, Richmond Co.
Harding Morse ..... Steamburg, Cattaraugus Co.
D. T. Bayles & Son ..... Stony Brook, Suffolk Co.
J. J. Conrad ..... Strykersville, Wyoming Co.
Wm. S. Kirsch ..... Strykersville, Wyoming Co.
Wicker Lumber Co ..... Suspension Bridge, Niag. Co.
Arthur Deuse ..... Swartwood, Chemung Co.
Chapman Lumber Co., Carbon st ..... Syracuse, Onondaga Co.
J. K. McDowell, 211 Wilkinson st ..... Syracuse, Onondaga Co.
J. E. Mulherub, 331 N. Salina st ..... Syracuse, Onondaga Co.

George Heller & Son ..... Theresa, Jefferson Co.
Eastern Lumber Co ..... Tonawanda, Niagara Co.
Charles Collins & Son ..... Troy, Rensselaer Co.
W. E. Martin ..... Troy, Rensselaer Co.
The Santa Clara Lumber Co ..... Tupper Lake, Franklin Co.

Nellie Amos & Swift ..... Utica, Oneida Co.

The N. A. Tyler Lumber Co ..... Vernon, Oneida Co.
Charles H. Hess ..... Vernon Center, Oneida Co.

Warrensburg Planing Mill Co ..... Warrensburg, Warren Co.
Welch Bros. ..... Warwick, Orange Co.
Charles W. Sloan & Son ..... Watertown, Jefferson Co.
G. W. White & Son ..... Watertown, Jefferson Co.
W. H. Marsh & Co ..... Watervliet, Albany Co.
A. L. Smith & Co ..... Watkins, Schuyler Co.
Wolff Lumber Co ..... Wayland, Steuben Co.
Hanks & Vickland ..... Wellsville, Allegany Co.
Westfield Lumber & Coal Co ..... Westfield, Chautauqua Co.
William S. Van Clief ..... West New Brighton, Richmond Co.
E. F. Gerwitz ..... West Valley, Cattaraugus Co.
Wevertown Saw Mill ..... Wevertown, Warren Co.
F. H. Lyman ..... Whippleville, Franklin Co.
A. H. Smith ..... White Plains, Westchester Co.
Denton & Waterbury ..... Whitesbore, Oneida Co.
Knox Rieman Co ..... Williamsville, Erie Co.
H. A. Beede ..... Willsboro, Essex Co.
H. H. Giles ..... Wilson, Niagara Co.
G. S. Van Buskirk ..... Wiscoy, Allegany Co.
B. T. Clark ..... Woodbourne, Sullivan Co.

Yerks & Co ..... Yonkers, Westchester Co.

Plumbers' Woodwork

Coyne & Delaney Co., 832 Kent av ..... Brooklyn, Kings Co.

A. Wyckoff & Son Co ..... Elmira, Chemung Co.

M. P. Berglas Mfg. Co., 10 Fulton st ..... New York, New York Co.
Shwab Bros. Co., 811 E. 9th st ..... New York, New York Co.

Printing Materials

American Wood Type Co., 302 McDougal st.	Brooklyn, Kings Co.
A. R. Kohler, 567 Washington st	Buffalo, Erie Co.
Setter Bros. Co	Cattaraugus, Cattaragus Co.
Morgans & Wilcox Mfg. Co	Middletown, Orange Co.
Frend Ungford Chambers Co., Inc	New York, New York Co.
Roscoe Ten Pin Co	Roscoe, Sullivan Co.

Professional and Scientific Instruments

Ansco Co.–Camera Works	Binghamton, Broome Co.
Eberhard Faber, 37 Greenpoint av	Brooklyn, Kings Co.
Up–To–Date Advertising Co	Canisteo, Steuben Co.
I. T. R. Co	Endicott, Broome Co.
American Mfg. Concern	Falconer, Chautauqua Co.
N. Y. Mallet & Handle Works	New York, New York Co.
Charles Tallners	Pulaski, Oswego Co.
Bausch & Lomb Optical Works	Rochester, Monroe Co.
Eastman Kodak Co	Rochester, Monroe Co.
Seneca Camera Mfg. Co	Rochester, Monroe Co.
Taylor Instrument Co., 95 Ames st	Rochester, Monroe Co.
Lucus Tuttle Mfg. Co	Silver Springs, Wyoming Co.
W. & L. E. Gurley	Troy, Rensselaer Co.

Pulleys and Conveyors

Excelsior Pulley Co	Cuba, Allegany Co.
Western Block Co	Lockport, Niagara Co.
Oneida Wood Pulley Co., Inc	Oneida, Madison Co.
John M. Tousten Co., 110 Mill st	Rochester, Monroe Co.

Pumps and Piping

A. Wyckoff & Son Co	Elmira, Chemung Co.
Robert Hoes	Malden Bridge, Columbia Co.
American District Steam Co	No. Tonawanda, Niagara Co.
A. A. Babcock Pump Co	Ogdensburg, St. Lawrence Co.
Lymen Curren	Springlake, Cayuga Co.
A. W. Winters, Jr	Unionville, Orange Co.

Refrigerators and Kitchen Cabinets

Colonial Mantel & Refrigerator Co., 494 Dumont av ..... Brooklyn, Kings Co.
McKee Refrigerator Co..... Brooklyn, Kings Co.
Heinz & Munshauer..... Buffalo, Erie Co.
Jewett Refrigerator Co..... Buffalo, Erie Co.
A. F. Meyer & Sons Co., 408 Broadway.... Buffalo, Erie Co.

Fayetteville Mfg. Co..... Fayetteville, Onondaga Co.

Garland Refrigerator Co., Beech st..... Mt. Vernon, Westchester Co.

Dubois Refrigerator Co., Inc., 107–111 W. 18th st..... New York, New York Co.
Anton Larsen & Sons, Brook av. & 134th st. New York, New York Co.
Lorillard Refrigerator Co., Madison av. at 48th st..... New York, New York Co.
James McLean, Inc., 537 W. 53d st..... New York, New York Co.
L. H. Mace & Co., Inc., 55 150th st..... New York, New York Co.
J. M. Saulpaugh Sons, 705 E. 11th st.... New York, New York Co.
William Williams Co., 312 E. 95th st.... New York, New York Co.

Trotter Refrigerator Co..... Rochester, Monroe Co.

Sash, Doors, Blinds, and General Millwork

O. D. Greene..... Adams, Putnam Co.
Park, Winton & True Co..... Addison, Steuben Co.
Blakeslee Lumber Co..... Albany, Albany Co.
Cameron & Hawn ..... Albany, Albany Co.
Ransdill & Co..... Albany, Albany Co.
C. M. Mallory..... Albion, Orleans Co.
F. D. Blowstein..... Amenia, Dutchess Co.
Kelly–Green Co..... Amsterdam, Montgomery Co.
J. D. Lasher..... Amsterdam, Montgomery Co.
McNeil Mfg. Co..... Amsterdam, Montgomery Co.
George D. Bethel ..... Antwerp, Jefferson Co.
Elmer E. Spencer..... Arcade, Wyoming Co.
H. V. Mix..... Argyle, Washington Co.
Weesburg–Baer Co..... Astoria, Queens Co.
Wesley Ranger ..... Attica, Wyoming Co.
Clark Lumber Co..... Auburn, Cayuga Co.
Luke B. Williams..... Auburn, Cayuga Co.
E. W. Featherston ..... Au Sable Forks, Essex Co.

Streever Lumber Co..... Ballston Spa., Saratoga Co.
L. W. Keeler & Son..... Bangor, Franklin Co.
The Batavia & New York Wood Working Co ..... Batavia, Genesee Co.
Batavia Lumber & Coal Co..... Batavia, Genesee Co.
Jones Bros. & Parker..... Bath, Steuben Co.
Charles E. Kirkup..... Bay Shore, Suffolk Co.
Bartlett & Co..... Binghamton, Broome Co.
Junius I. Bishop..... Binghamton, Broome Co.
John L. Lewis ..... Binghamton, Broome Co.

James O'Neil	Binghamton, Broome Co.
Ed. & Wm. Van Antwerp	Binghamton, Broome Co.
Barber & Robinson	Bolton Landing, Warren Co
W. M. Hubbard	Brewerton, Onondaga Co.
John D. Morehouse	Brewster, Putnam Co.
East Hampton Lumber & Coal Co	Bridgehampton, Suffolk Co.
Charles Vail	Broadalbin, Fulton Co.
Alpert Woodworking Corp, 410 Snediker av	Brooklyn, Queens Co.
Louis Bossert & Sons, Inc., 1335 Grand st.	Brooklyn, Queens Co.
M. J. Britt, E. 17th st. & Emmers Lane	Brooklyn, Queens Co.
Louis Brook, Inc., 148 India st	Brooklyn, Queens Co.
Brooklyn Fireproof Sash & Door Co., 87–105 Richardson st	Brooklyn, Queens Co.
Cross, Austin & Ireland, 1246 Grand st	Brooklyn, Queens Co.
S. Davis, 222 Newell st	Brooklyn, Queens Co.
Eastern Fireproof Sash & Door Co., 826 Flushing av	Brooklyn, Queens Co.
Eastern Woodworking Co., 820 Stone av	Brooklyn, Queens Co.
East N. Y. Sash Door & Trim Co., 245 Belmont av	Brooklyn, Queens Co.
Eichmann Co., 7 McKibben st	Brooklyn, Queens Co.
A. Entenman, Inc., 669 73d st	Brooklyn, Queens Co.
Samuel Feldman, 511 Flushing av	Brooklyn, Queens Co.
I. Feldman & Son, 98 Engert av	Brooklyn, Queens Co.
Fisher & Voorhies, Av. S. & W. 10th st	Brooklyn, Queens Co.
Haugard Bros., 1429 Metropolitan av	Brooklyn, Queens Co.
Benj. G. Hitchings, 999 E. 34th st	Brooklyn, Queens Co.
Frank Hockin, 107 Pine st	Brooklyn, Queens Co.
Interboro Sash & Door Co., 352 Junius st	Brooklyn, Queens Co.
S. Jacobs & Sons, 1365 Flushing av	Brooklyn, Queens Co.
C. R. Macaulay Co., 18th st. & Fifth av	Brooklyn, Queens Co.
John P. Milliken Co., 560 Willoughby av	Brooklyn, Queens Co.
Jacob Morganthaler & Son, 663 Sackett st.	Brooklyn, Queens Co.
The Mortonsen Wood Working Co., Inc., 554 Hamilton av	Brooklyn, Queens Co.
National Sash & Door Co., 137 Bayard st	Brooklyn, Queens Co.
J. P. Oates, Provost & Greenpoint av	Brooklyn, Queens Co.
Prims & Klein, 158–160 Walworth st	Brooklyn, Queens Co.
Reliance Fireproof Door Co., 78 West st	Brooklyn, Queens Co.
Robins Dry Dock & Repairs Co., Foot Beard st	Brooklyn, Queens Co.
J. Sklar Wood Work Co., Inc., 672 Hopkinson av	Brooklyn, Queens Co.
E. C. Smith, 420 Oakland st	Brooklyn, Queens Co.
Star Wood Turning Co., 276 Newport av	Brooklyn, Queens Co.
Estate of S. Weinstein, 95 Frost st	Brooklyn, Queens Co.
Behringer Bros., Inc., 167 Imson st	Buffalo, Erie Co.
Charles Boller & Sons Co	Buffalo, Erie Co.
Buffalo Grille Co	Buffalo, Erie Co.
Dohn, Fischer & Beyer, Inc., 1340 Niagara st	Buffalo, Erie Co.
G. Elias & Bro., Inc	Buffalo, Erie Co.
John Feist & Sons Co., 111 Ash st	Buffalo, Erie Co.
Christian Flierl Co., Inc., 1352 Genesee st.	Buffalo, Erie Co.
John E. Grenzebach, 2745 Seneca st	Buffalo, Erie Co.

E. M. Hager & Sons Co., 141 Elm st..... Buffalo, Erie Co.
William Hendrich's Sons Co..... Buffalo, Erie Co.
Huntington & Finke Co., 625 Tonawanda st Buffalo, Erie Co.
International Cabinet Co., 39 Henry st.... Buffalo, Erie Co.
Morse Sash & Door Co., 340 W. Main st... Buffalo, Erie Co.
Mosier & Summers, 1266 Seneca st..... Buffalo, Erie Co.
Smith Elevator Co., Inc., 301 Liberty Bldg. Buffalo, Erie Co.
L. N. Whissel Lumber Corp., 577–615 Cambridge st..... Buffalo, Erie Co.

H. E. Holbrook Co..... Caledonia, Livingston Co.
Martin Hermann ..... Callicoon, Sullivan Co.
George W. Dana..... Camden, Oneida Co.
George T. Thompson ..... Canandaigua, Ontario Co.
Louis Tobin ..... Canandaigua, Ontario Co.
Alfred E. Dew & Son..... Canastota, Madison Co.
John Coakley ..... Canton, St. Lawrence Co.
J. W. Rushton..... Canton, St. Lawrence Co.
H. I. Starkweather..... Carthage, Jefferson Co.
Charles Beardsley ..... Catskill, Greene Co.
Catskill Supply Co..... Catskill, Greene Co.
William Bihl ..... Central Islip, Suffolk Co.
John Earl ..... Champlain, Clinton Co.
The Otis Brooks Lumber Co..... Clayton, Jefferson Co.
A. Van Auken ..... Cobleskill, Schoharie Co.
G. H. Crandall Co..... Cohoes, Albany Co.
Kraemer Bros Co..... College Pt., L. I., Suffolk Co.
Joseph P. Brady..... Cooperstown, Otsego Co.
Corning Building Co..... Corning, Steuben Co.
H. R. Taylor Corp..... Cornwall, Orange Co.
Mead & Taft Co..... Cornwall Landing, Orange Co.
Johnson & Bernston..... Corona, Steuben Co.
H. F. Benton Lumber Co..... Cortland, Cortland Co.
H. W. Newton ..... Cortland, Cortland Co.
C. V. Peck..... Cortland, Cortland Co.
Phelps & Sibley..... Cuba, Allegany Co.
Rowley Bros ..... Cuba, Allegany Co.
Gould Coupler Co..... Depew, Erie Co.
Dexter Woodworking & Bldrs. Sup Co.... Dexter, Jefferson Co.
J. E. Harnahan..... Dobbs Ferry, Westchester Co.
Dunkirk Lumber & Coal Co..... Dunkirk, Chautaqua Co.
Madigan Lumber Co..... Dunkirk, Chautaqua Co.
J. A. Taylor ..... Dunkirk, Chautaqua Co.

Zink Lumber Co. Inc..... East Aurora, Erie Co.
Henry W. Burt..... East Northport, Suffolk Co.
H. T. Gumtow..... Eden, Erie Co.
E. L. Ackerman ..... Edmeston, Otsego Co.
E. A. Aldous ..... Edwards, St. Lawrence Co.
Harris, McHenry & Baker Co..... Elmira, Chemung Co.
Kertscher & Co..... Elmira, Chemung Co.
Public Schools ..... Elmira, Chemung Co.
H. C. Spaulding Co..... Elmira, Chemung Co.
J. N. Wood & Co., Inc..... Elmira, Chemung Co.

Young Lumber Co	Elmira, Chemung Co.
Endicott Box & Lumber Co	Endicott, Broome Co.
Light-Unkefer Co	Endicott, Broome Co.
Fairport Lumber & Coal Co	Fairport, Monroe Co.
George Adams Lumber Co	Far Rockaway, Queens Co.
George Closs	Far Rockaway, Queens Co.
Hicks, Hicks & Hicks	Far Rockaway, Queens Co.
Keshin, Blistern & Co	Far Rockaway, Queens Co.
Muller & Buckley	Far Rockaway, Queens Co.
Ralph O'Rorke	Far Rockaway, Queens Co.
W. E. Durhams	Fayetteville, Onondaga Co.
Allegany Lumber Co	Fillmore, Allegany Co.
Copp & Stratton	Flushing, Queens Co.
Ahrens & Salhoff	Fredonia, Chautauqua Co.
Sackett Screen Co	Fredonia, Chautauqua Co.
Silts Machine Shop	Fulton, Oswego Co.
George Deis & Son Co	Fulton Chain, Herkimer Co.
H. A. Irmler	Gardenville, Erie Co.
J. G. Henry	Geneva, Ontario Co.
Roland E. Lasher	Germantown, Columbia Co.
Kendrick & Brown Co	Glens Falls, Warren Co.
Burr Lumber Co	Gloversville, Fulton Co.
Holden Lumber Co	Gloversville, Fulton Co.
F. W. Jacksons	Good Ground, Suffolk Co.
Samuel C. Warner	Good Ground, Suffolk Co.
C. A. Corwin & Son	Greenport, Suffolk Co.
Henry A. Hedges	Greenport, Suffolk Co.
Stewart Thomas	Greenport, Suffolk Co.
Harriman Industrial Corp	Harriman, Orange Co.
Clark & Bennett Lumber Co	Haverstraw, Rockland Co.
J. H. Haney	Hensonville, Greene Co.
C. R. Snell & Sons	Herkimer, Herkimer Co.
West Canada Lumber Co	Herkimer, Herkimer Co.
Estate of Charles H. Voigt	Hicksville, Nassau Co.
James Elgar, Inc	Hornell, Steuben Co.
Hornell Lumber Co	Hornell, Steuben Co.
Weaver Building & Supply Co., Inc	Hudson, Columbia Co.
Brookside Planing Mill	Huntington, Suffolk Co.
Huntington Sash & Door Co	Huntington, Suffolk Co.
Conrad Klipper	Ilion, Herkimer Co.
A. M. Hunter & Sons	Irvington, Westchester Co.
Lord & Burnham Co	Irvington, Westchester Co.
B. S. Raynor	Islip, Suffolk Co.
Cornell University Repair Dept	Ithaca, Tompkins Co.
N. Y. State Agricultural College at Cornell	Ithaca, Tompkins Co.
Potter & Allen	Ithaca, Tompkins Co.
Robinson & Carpenter	Ithaca, Tompkins Co.
Edward Sprigg	Ithaca, Tompkins Co.
John R. Carpenter	Jamaica, Queens Co.
E. & J. Dorf Son Co	Jamaica, Queens Co.

Alex. Piercey	Jamaica, Queens Co.
James H. Stansbury	Jamaica, Queens Co.
Lindbeck Lumber & Mfg Co	Jamestown, Chautauqua Co.
Nelson Bros.	Jamestown, Chautauqua Co.
Watson Mfg. Co	Jamestown, Chautauqua Co.
Estate John T. Wilson	Jamestown, Chautauqua Co.
Lestershire Lumber & Box Co	Johnson City, Broome Co.
Snyder & Way	Johnstown, Fulton Co.
Levi Stephenson	Johnstown, Fulton Co.
Stephenson & Newnham	Johnstown, Fulton Co.
Oneida Community, Ltd	Kenwood, Madison Co.
J. A. Milhern	Kingston, Ulster Co.
H. W. Palen's Sons	Kingston, Ulster Co.
Theo. Weeks & Son	Kingston, Ulster Co.
F. A. Montanye	Lacona, Oswego Co.
Lake Hill Wood Products Co	Lake Hill, Ulster Co.
Lake Placid Co	Lake Placid Club, Essex Co.
John Knauber	Lancaster, Erie Co.
J. H. Smith & Co	Lawrence, Nassau Co.
John A. Wood & Son Co	Lawrence, Nassau Co.
John J. Wood & Co	Lawrence, Nassau Co.
Joseph Lapp	LeRoy, Genesee Co.
F. C. Rogers	LeRoy, Genesee Co.
A. Little & Son	Little Falls, Herkimer Co.
S. P. McCloy	Lockport, Niagara Co.
G. W. Pencille	Lockport, Niagara Co.
Joseph Whelan	Lockport, Niagara Co.
Almar Manufacturing Co	Long Isl. City, Queens Co.
William Couch	Long Isl. City, Queens Co.
Lagana & Co	Long Isl. City, Queens Co.
Charles B. Mayer Architectural Woodworking Co.	Long Isl. City, Queens Co.
J. Murname, 37 Beebe av	Long Isl. City, Queens Co.
Tisdale Lumber Co	Long Isl. City, Queens Co.
The Courbot Co., Inc	Mallory, Oswego Co.
C. H. Dupree, Agt	Malone, Franklin Co.
Mamaroneck Lbr. & Supply Co	Mamaroneck, Westchester Co.
Mamaroneck S. D. & Tr. Co	Mamaroneck, Westchester Co.
Wines & Homan	Mattituck, Suffolk Co.
William Barber	Mechanicsville, Saratoga Co.
Pruyn Lbr. & Supply Co	Mechanicsville, Saratoga Co.
Thos. Bush	Middleburg, Schoharie Co.
J. C. Warner	Middleburg, Schoharie Co.
Giles & Giles Co	Middletown, Orange Co.
Tyrell & Kinner	Middletown, Orange Co.
Swift Bros., Inc	Millbrook, Dutchess Co.
Frank Godsky & Co	Mineola, Nassau Co.
R. L. Teeter	Moravia, Cayuga Co.
E. N. Austin	Morristown, St. Lawrence Co.
D. F. Dakin Co	Mount Kisco, Westchester Co.
H. L. Crain	Mount Upton, Chenango Co.
George L. Thayer	Mount Upton, Chenango Co.

Bengston & Nordholm	Mt. Vernon, Westchester Co.
Burton & Fenton	Mt. Vernon, Westchester Co.
Kapp & Nordholm Co	Mt. Vernon, Westchester Co.
L. Vinton & Sons	Mt. Vernon, Westchester Co.
Norman Weiss	Mt. Vernon, Westchester Co.
Wilson & Adams Co	Mt. Vernon, Westchester Co.
S. N. Keener Co	Newark, Wayne Co.
Newburg Plaining Mill Co	Newburgh, Orange Co.
Newfane Lbr. & Mfg. Co	Newfane, Niagara Co.
Hubbell Hardwood Door Co	N. Rochelle, Westchester Co.
The J. A. Mahlstedt Lumber & Coal Co	N. Rochelle, Westchester Co.
Ahneman & Younkheers, 3320 Bailey av	New York, New York Co.
Bardsley Bros. Co., 147–151 Baxter st	New York, New York Co.
Baumgarten & Co., 715 5th av	New York, New York Co.
Charles F. Biele & Sons Co., 381 W. 12th st	New York, New York Co.
Bronx Sash & Door Co., 180th st. & E. Tremont av	New York, New York Co.
John H. Carl & Sons, Inc., 514 First av	New York, New York Co.
A. C. Chesley Co., Inc., 277 Rider av	New York, New York Co.
City Kalamein Co., Inc., 4485 3d av	New York, New York Co.
Dunbar Box & Lumber Co., 282 11th av	New York, New York Co.
F. Eckenroth & Son, 921 E. 5th st	New York, New York Co.
Eureka Woodworking Co., 318 E. 75th st	New York, New York Co.
Fischer Bros., 5th av. & 137th st	New York, New York Co.
James C. Forbes, Beach av	New York, New York Co.
Jacob Froehlich Cabinet Works, 1041 Leggett av	New York, New York Co.
Frank G. Hall, 310 E. 75th st	New York, New York Co.
Hogan & Di-Genno, 1616 Webster av	New York, New York Co.
L. Kern, 422 E. 92d st	New York, New York Co.
Kessler Bros., Inc., 312–316 E. 95th st	New York, New York Co.
David Kramer, 43 Broad st	New York, New York Co.
J. F. McLaughlin, 314 E. 75th st	New York, New York Co.
Manhattan Woodworking Co., 281 Rider av.	New York, New York Co.
Matteawan Mfg. Co., 392 5th av	New York, New York Co.
Henry H. Meise & Son, Inc., 192 Southern blvd.	New York, New York Co.
Mount & Robertson, Inc., 41 Beaver st	New York, New York Co.
New York Woodworking Corp., 506 E. 19th st.	New York, New York Co.
H. Pearlman, 858 8th av	New York, New York Co.
J. M. Prudvosky, 432 E. 10th st	New York, New York Co.
Charles Read, 406 W. 30th st	New York, New York Co.
J. & W. Robb, 245–247 W. 28th st	New York, New York Co.
Salom & Wuthe Co., Inc., 521 E. 72d st	New York, New York Co.
J. M. Saulpaugh Sons, 705 E. 11th st	New York, New York Co.
F. Schaettler, 533–537 W. 34th st	New York, New York Co.
Schoeller & Richter, Inc., 537 W. 53d st	New York, New York Co.
Sherwin & Berman, Inc., 405 E. 4th st	New York, New York Co.
Sol. S. Silver & Co. Inc., 101 Park av	New York, New York Co.
Skirwanek & Taunhaeuser, 1110 First av	New York, New York Co.
Sloane & Moller, Inc., 316 E. 65th st	New York, New York Co.
Star Fire Proof Door & Sash Co., 2650–2652 Park av	New York, New York Co.

Superior Fire Proof Door & Sash Co., 1811 Carter av..... New York, New York Co.
Tiger & Dreeben, 4 & 6 Tompkins st..... New York, New York Co.
Unionport Woodworking Co., West Chester av. & White Plassis rd..... New York, New York Co.
C. S. Utterson, Inc., 941 6th av..... New York, New York Co.
Cheseboro Whilman, 1167 1st av..... New York, New York Co.
Alfred Wick, 276 9th av..... New York, New York Co.
Charles Wollersen, 514 W. 46th st..... New York, New York Co.
Wm. P. Youngs & Bro., 1st av. & 35th st.. New York, New York Co.
F. E. Zimmerman & Co., 13 Baxter st..... New York, New York Co.
S. W. Johnson & Son..... Nichols, Tioga Co.
Fred Lindow, Sr..... North Collins, Erie Co.
Ray H. Bennett Lumber Co..... No. Tonawanda, Niagara Co.
George C. Meyers..... No. Tonawanda, Niagara Co.
W. G. Palmer, Inc..... No. Tonawanda, Niagara Co.
E. J. Elliott..... Norwich, Chenango Co.
Rollin D. Reed..... Norwood, St. Lawrence Co.

W. J. Pooler..... Ogdensburg, St. Lawrence Co.
Proctor Mfg. Co..... Ogdensburg, St. Lawrence Co.
A. Weston Lumber Co..... Olean, Cattaraugus Co.
Appleby & Deen..... Ossining, Westchester Co.
M. J. Gallagher..... Ossining, Westchester Co.
Isaac Terwilliger's Sons..... Ossining, Westchester Co.
S. E. Fournier..... Oswego, Oswego Co.
James C. Harding Son..... Oswego, Oswego Co.
A. Paine & Son..... Oswego, Oswego Co.
Post & Henderson..... Oswego, Oswego Co.

C. H. Vrooman..... Patchogue, Suffolk Co.
Pendleton & Townsend..... Patterson, Putnam Co.
Paul Smiths Hotel Co..... Paul Smiths, Franklin Co.
William Brotherton's Sons..... Peekskill, Westchester Co.
David Andrus..... Perry, Wyoming Co.
A. J. Schwind..... Perry, Wyoming Co.
A. Mason & Sons..... Peru, Clinton Co.
E. C. Vickery..... Phoenix, Oswego Co.
La Croix Sash & Door Co..... Plattsburg, Clinton Co.
Plattsburg Lumber Co..... Plattsburg, Clinton Co.
Lester Tompkins..... Poland, Herkimer Co.
George Mertz & Sons..... Port Chester, Westchester Co.
Port Chester Lumber Co..... Port Chester, Westchester Co.
Loper Bros..... Port Jefferson, Suffolk Co.
W. W. Hendrickson Co..... Port Jervis, Orange Co.
Charles Lindquist..... Port Richmond, Richmond Co.
Wm. S. Van Clief & Sons..... Port Richmond, Richmond Co.
Grant Street Planing Mill..... Potsdam, St. Lawrence Co.
Brooks & Co..... Poughkeepsie, Dutchess Co.
Levi Lumb's Son..... Poughkeepsie, Dutchess Co.
Charles Tallners..... Pulaski, Oswego Co.

Cook & Smith..... Redwood, Jefferson Co.
George Van Allen..... Rensselaer, Rensselaer Co.
Zepf Bros..... Rensselaer, Rensselaer Co.

Charles Skidmore	Riverhead, Suffolk Co.
Bantleon Bros. Co., 97 Railroad st	Rochester, Monroe Co.
Bausch & Lomb Optical Co	Rochester, Monroe Co.
Department of Public Instruction	Rochester, Monroe Co.
Philipp Enders & Son, 52 Rustic st	Rochester, Monroe Co.
W. K. Goetzman, 204 Water st	Rochester, Monroe Co.
Hollister Lumber Co., 100 Anderson av	Rochester, Monroe Co.
Palmer-Marcy Co., 36 Harrison st	Rochester, Monroe Co.
John B. Pike	Rochester, Monroe Co.
F. H. Phelps Lumber Co	Rochester, Monroe Co.
J. H. Reinhard & Son, 17 Favor st	Rochester, Monroe Co.
H. P. Sickles Co., 840 University av	Rochester, Monroe Co.
Smith Sash & Door Co., 175 Exchange st	Rochester, Monroe Co.
Spencer Lumber Co	Rochester, Monroe Co.
Stoertz Bros., 18 Commercial st	Rochester, Monroe Co.
Vogel & Binder Co., 388 St. Paul st	Rochester, Monroe Co.
Beach Lumber Co	Rome, Oneida Co.
Edward Comstock Co	Rome, Oneida Co.
Conklin, Tribby & Conklin	Roslyn, Nassau Co.
Isaac Hicks	Roslyn, Nassau Co.
George H. Cleveland	Sag Harbor, Suffolk Co.
Branch & Calloran	Saranac Lake, Franklin Co.
Hoyle & Tagliabue	Saranac Lake, Franklin Co.
J. J. O'Connell	Saranac Lake, Franklin Co.
W. J. Case & Sons	Saratoga Spgs., Saratoga Co.
Carl J. Lundgren	Saratoga Spgs., Saratoga Co.
Peckham, Wolf & Co	Schenectady, Schenectady Co.
J. B. Pierce	Schenectady, Schenectady Co.
J. Young	Schenectady, Schenectady Co.
Alva Laucks	Schoharie, Schoharie Co.
Ansell Raynor	Seaford, Nassau Co.
B. Merenes	Seward, Schoharie Co.
Vosburgh & Stone	Shady, Ulster Co.
John J. Hixson	Shortsville, Ontario Co.
Arthur Stevens	Shortsville, Ontario Co.
G. A. Clark Co	Sidney, Delaware Co.
August Kofoed	Sliver Creek, Chautauqua Co.
C. E. Smith & Co	Skaneateles, Onondaga Co.
F. G. Booth	Smithtown Branch, Suffolk Co.
D. W. Smith	South Bethlehem, Albany Co.
E. O. Fordham	Speonk, L. I., Suffolk Co.
Henry Salzler Co	Springville, Erie Co.
Springville Planing Mills	Springville, Erie Co.
Fred Cook	Stamford, Delaware Co.
H. S. Farrell	Staten Island, Richmond Co.
Branch Bros	Suspension Bridge, Niag. Co.
Haeberle Lumber Co	Suspension Bridge, Niag. Co.
August Steinbremer	Suspension Bridge, Niag. Co.
Wicker Lumber Co	Suspension Bridge, Niag. Co.
Joseph Caldwell, 250 Tallman st	Syracuse, Onondaga Co.
Chapman Lumber Co., Carbon st	Syracuse, Onondaga Co.
Doxtader & Wilcoxen, 408 E. Canal st	Syracuse, Onondaga Co.
E. Hagedorn Mfg. Co., Oakwood st	Syracuse, Onondaga Co.

Michael Hemmer, 215 Sunset Av..... Syracuse, Onondaga Co.
John H. Lyons, Inc., 542 Canal st..... Syracuse, Onondaga Co.
J. K. McDowell, 211 Wilkinson st..... Syracuse, Onondaga Co.
Mann & Hunter Lumber Co..... Syracuse, Onondaga Co.
Market Mfg. Co., 618 E. Water st..... Syracuse, Onondaga Co.
J. E. Mulheim, 331 N. Salina st..... Syracuse, Onondaga Co.
J. M. Scott, Director of Industrial Education..... Syracuse, Onondaga Co.
John J. Sherlock, 206 Canal st..... Syracuse, Onondaga Co.
Wilson & Greene Lumber Co..... Syracuse, Onondaga Co.

Geo. Heller & Son..... Theresa, Jefferson Co.
Madden Lumber Co..... Troy, Rensselaer Co.
T. D. Wadelton..... Tuckahoe, Westchester Co.

Amos Nellis & Swift..... Utica, Oneida Co.
Philip Thomas' Sons..... Utica, Oneida Co.

James Horton..... Warwick, Orange Co.
Charles W. Sloat & Son..... Watertown, Jefferson Co.
W. A. Sullivan Lumber Co., Inc..... Watertown, Jefferson Co.
W. H. Marsh & Co..... Watervliet, Albany Co.
Thomas F. Sheehan..... Watervliet, Albany Co.
James T. Young..... Watervliet, Albany Co.
Westfield Lumber & Coal Co..... Westfield, Chautauqua Co.
Frank McWilliams..... W. New Brighton, Richm' dCo.
Frank N. Goble..... White Plains, Westchester Co.
Kelsey, Smith & Co., Inc..... White Plains, Westchester Co.
H. F. Giles..... Wilson, Niagara Co.
A. B. Brown Co..... Woodside, Queens Co.
Handshur & Sindler..... Woodside, Queens Co.
Norman–Seton, Inc..... Woodside, Queens Co.
Hadsell Bros. Co., Inc..... Worcester, Otsego Co.

F. B. Mee..... Yonkers, Westchester Co.
S. F. Quick & Sons..... Yonkers, Westchester Co.
Saunders' Trades School..... Yonkers, Westchester Co.
Yerks & Co..... Yonkers, Westchester Co.
H. C. Shumaker..... Youngstown, Niagara Co.

Shade and Map Rollers

John Kroder & Henry Reubel Co., 109 Meeker av..... Brooklyn, Kings Co.

Brannan Mfg. Co..... Carthage, Jefferson Co.

The Columbia Mills, 225 Fifth av..... New York, New York Co.

Standard Shade Roller Co..... Ogdensburg, St. Lawrence Co.

Ship and Boat Building

J. H. Brown..... Alexandria Bay, Jefferson Co.
Charles J. Estes..... Alexandria Bay, Jefferson Co.
J. B. & R. L. Reil..... Alexandria Bay, Jefferson Co.
Thomas Thurston..... Alexandria Bay, Jefferson Co.

Ward & Co., 54 Fulton av	Astoria, L. I., Queens Co.
R. Lenahan	Athens, Greene Co.
Albert V. Rogers	Bayshore, Suffolk Co.
Henry V. Watkins	Bellport, Suffolk Co.
Wm. J. Ridgely	Boonville, Oneida Co.
T. M. Milton & Sons	Brewerton, Onondaga Co.
Brooklyn Spar Co., foot of Columbia st	Brooklyn, Kings Co.
Ira S. Bushey & Sons, Inc., 764 Court st	Brooklyn, Kings Co.
Theo. A. Crane's Sons Co., foot Columbia st	Brooklyn, Kings Co.
C. M. Englis, Inc., 245 Greenpoint av	Brooklyn, Kings Co.
Furman Dry Dock Co., foot of 20th st	Brooklyn, Kings Co.
Wm. J. Gokey & Co., Inc., Pier L, Erie Basin	Brooklyn, Kings Co.
Jakobson & Peterson, foot 24th st	Brooklyn, Kings Co.
Kells Mill & Lumber Co., Java & Provost sts	Brooklyn, Kings Co.
Thomas F. Meehan & Son, 43 Van Brunt	Brooklyn, Kings Co.
Morse Dry Dock & Repair Co., foot 56th st	Brooklyn, Kings Co.
Robins Dry Dock & Repair Co., foot Beard st	Brooklyn, Kings Co.
Schuyler & Caddell, pier 2 Erie basin	Brooklyn, Kings Co.
James Shewan & Sons, Inc., foot of 27th st	Brooklyn, Kings Co.
Buffalo Dry Dock Co	Buffalo, Erie Co.
Cowles Shipyard Co	Buffalo, Erie Co.
Fix Bros, foot of Amherst st	Buffalo, Erie Co.
Great Lakes Dredge & Dock Co., 1100 Morgan bldg	Buffalo, Erie Co.
W. E. Dodge	Cape Vincent, Jefferson Co.
Bredenburg Bros	Champlain, Clinton Co.
Robert Jacob, City Island av	City Islnd, N. Y., N. Y. Co.
Kyle & Purdy, Inc	City Islnd, N. Y., N. Y. Co.
The Otis Brooks Lumber Co	Clayton, Jefferson Co.
Walter E. Abrams	Cold Spring Harbor, Suffolk Co.
College Point Boat Corp	College Point, L. I., Queens Co.
J. Newton Hand	East Moriches, Suffolk Co.
Charles M. Allen, Inc	Fulton, Oswego Co.
Fay & Bowen Eng. Co	Geneva, Ontario Co.
Fyfe's Shipyard	Glenwood Landing, Nassau Co.
Albertson Construction Co	Greenport, Suffolk Co.
Eastern Shipyard Co	Greenport, Suffolk Co.
Greenport Basin & Construction Co	Greenport, Suffolk Co.
Greenport Ship Co., Inc	Greenport, Suffolk Co.
J. W. Ketcham	Greenport, Suffolk Co.

Harriman Industrial Corp	Harriman, Orange Co.
Richard B. Chute, Jr	Huntington, Suffolk Co.
Wheeler Shipbuilding Co., Inc	Huntington, Suffolk Co.
Dennis Donovan	Kingston, Ulster Co.
C. Hildebrant	Kingston, Ulster Co.
Kingston Shipbuilding Corp	Kingston, Ulster Co.
R. Lenahan Co	Kingston, Ulster Co.
Daniel Murphy	Kingston, Ulster Co.
Jacob Rice & Co	Kingston, Ulster Co.
Schoonmaker & Connors	Kingston, Ulster Co.
William J. Turk Co	Kingston, Ulster Co.
W. F. & R. Co	Kingston, Ulster Co.
George & Bliss	Lake Placid, Essex Co.
Orienta Boat Yards	Mamaroneck, Westchester Co.
Sound Machine Shop	Mamaroneck, Westchester Co.
S. F. Bauna	Mariners Harbor, Richmond Co.
William B. Hougheout	Mariners Harbor, Richmond Co.
Johnsons Shipyards Corp	Mariners Harbor, Richmond Co.
Staten Island Shipbuilding Co	Mariners Harbor, Richmond Co.
Consolidated Shipbuilding Corp	Morris Heights, N. Y., New York Co.
N. Y. Yacht, Launch & Eng. Co	Morris Heights, N. Y., New York Co.
National D. D. & Repair Co	New Brighton, Richmond Co.
O. Stoneburg	New Rochelle, Westchester Co.
American Balsa Co., 50 E. 42d st	New York, New York Co.
W. F. Ruddock Boat & Yacht Works, Inc., 214 st. & Harlem River	New York, New York Co.
Henry Steers, 17 Battery pl	New York, New York Co.
James Tregarthen & Sons Co., Inc., ft. E. 7th st	New York, New York Co.
United States Navy Yard	New York, New York Co.
Northport Shipbuilding Corp	Northport, Suffolk Co.
Richardson Boat Co	No. Tonawanda, Niagara Co.
International Shipbuilding & Marine Engineering Corp	Nyack, Rockland Co.
Nyack Shipbuilding Corp	Nyack, Rockland Co.
Julius Paterson	Nyack, Rockland Co.
Leyare Boat Works	Ogdensburg, St. Lawrence Co.
St. Lawrence Marine Railway	Ogdensburg, St. Lawrence Co.
Fulton Navigation Co	Old Forge, Herkimer Co.
Parsons Bros	Old Forge, Herkimer Co.
George D. Bishop	Patchogue, Suffolk Co.
DeWitt S. Conklin	Patchogue, Suffolk Co.

Yachting Dept., N. Y. A. C.	Pelham Manor, Westchester Co.
Bayles Shipyard, Inc.	Port Jefferson, Suffolk Co.
Alexander McDonald, Inc.	Port Richmond, Richmond Co.
O'Brien Bros	Port Richmond, Richmond Co.
Hopeman Bros. Mfg. Co, 569 Lyell av.	Rochester, Monroe Co.
William V. Long, 323 Jefferson av.	Rochester, Monroe Co.
Skaneateles Boat & Canoe Co.	Skaneateles, Onondaga Co.
Fred A. McMillin	Sodus Point, Wayne Co.
Dan M. Corwin	South Jamesport, Suffolk Co.
Johnson Shipyard Corp., Marine Harbor	Staten Island, Richmond Co.
A. C. Brown's Sons	Tottenville, Richmond Co.
Harry Cossey	Tottenville, Richmond Co.
John Matton	Waterford, Saratoga Co.
Albany Boat Corp.	Watervliet, Albany Co.
P. Jesse Matton	Watervliet, Albany Co.
Downey Shipbuilding Corp.	West New Brighton, Richmond Co.
National Dry Dock & Repair Co.	West New Brighton, Richmond Co.
National Dry Dock Co.	West New Brighton, Richmond Co.
Frank McWilliams, Inc.	West New Brighton, Richmond Co.

Shuttles, Spools and Bobbins

Avoca Mfg. Co.	Avoca, Steuben Co.
Big Indian Wood Products Co.	Big Indian, Ulster Co.
Lestershire Spool Mfg. Co.	Johnson City, Broome Co.

Sporting and Athletic Goods

Wm. J. Ridgely	Boonville, Oneida Co.
Bredenburg Bros	Champlain, Clinton Co.
Livingston Manor Turning Works	Livingston Manor, Sullivan Co.
Reiper Mfg. Co., 149 Baxter st.	New York, New York Co.
Sandford, Bell & Lahm, 61 4th av.	New York, New York Co.
H. Wagner & Adler Co., 30 Union sq.	New York, New York Co.
Frank Schwinkert & Son, 149 South av.	Rochester, Monroe Co.
Roscoe Ten Pin Co.	Roscoe, Sullivan Co.

Tanks and Silos

Mayer Tank Mfg. Co., Inc., 212–220 Russell st	Brooklyn, Kings Co.
Peter Pfeil Cooperage Works, 223–233 Madison st.	Buffalo, Erie Co.

Alfred E. Dew & Son..... Canastota, Madison Co.

F. E. Hudson & Sons..... Ellisburg, Jefferson Co.

Burr Lumber Co..... Gloversville, Fulton Co.
Holden Lumber Co..... Gloversville, Fulton Co.

Noble & Wood Machinery Co..... Hoosick Falls, Rensselaer Co.

D. H. Burrell & Co., Inc..... Little Falls, Herkimer Co.
A. Little & Sons..... Little Falls, Herkimer Co.

R. L. Teeter..... Moravia, Cayuga Co.

Newfane Lumber & Mfg. Co..... Newfane, Niagara Co.
Anton Hoffman, 317 E. 91st st..... New York, New York Co.
Isseks & Rosenwach, 94 Mangin st..... New York, New York Co.
National Cooperage Co., 501 Water st.... New York, New York Co.
J. Rosenwach, 615–625 Grand st..... New York, New York Co.
Morris Sheres, 460 E. 10th st..... New York, New York Co.
Enterprise Lumber & Silo Co..... North Tonawanda, Niag. Co.

Craine Silo Co., Inc..... Norwich, Chenango Co.

Carley Heater Co., Inc..... Olean, Cattaraugus Co.

T. J. Parry..... Remsen, Oneida Co.

B. Merenes ..... Seward, Schoharie Co.
Globe Silo Co..... Sidney, Delaware Co.
Lyons Mills ..... Solsville, Madison Co.
Samuel Wandell, Wythe Av. & N. 15th st.. South Brooklyn, Kings Co.

Unadilla Silo Co..... Unadilla, Otsego Co.

Toys

The J. S. Harrison Co..... Addison, Steuben Co.
The Embossing Co., 20 Pruyn st..... Albany, Albany Co.

The Wilkinson Mfg. Co..... Binghamton, Broome Co.
M. Gropper & Sons Bush Terminal..... Brooklyn, Kings Co.

Sherwood Bros. Mfg. Co..... Canastota, Madison Co.

American Mfg. Concern..... Falconer, Chautauqua Co.

Vincent & McDonald..... Gloversville, Fulton Co.

S. J. Bens Co..... Herkimer, Herkimer Co.

Medina Toy Co., Inc..... Medina, Orleans Co.

Walton Toy Co..... Walton, Delaware Co.

Trunks and Suit Cases

Bingham Trunk Co	Buffalo, Erie Co.
Buffalo Trunk Mfg. Co	Buffalo, Erie Co.
Charap & Mark, 101 Green st	New York, New York Co.
D. Diamond & Son, 315 E. 22d st	New York, New York Co.
Innovation Trunk Co., 3 Canal pl	New York, New York Co.
F. R. Merrall & Co., 505–507 E. 18th st	New York, New York Co.
H. Likly & Co., 330 Lyell st	Rochester, Monroe Co.
Syracuse Trunk Co., 444 S. Salina st	Syracuse, Onondaga Co.
H. C. Faber & Son Co., 12 Meadow st	Utica, Oneida Co.

Vehicles and Vehicle Parts

Knox & Schaible, 235–245 Spruce st	Albany, Albany Co.
W. S. Clark	Andover, Allegany Co.
A. G. Crawford	Angola, Erie Co.
Eagle Wagon Works	Auburn, Cayuga Co.
Avoca Wheel Co	Avoca, Steuben Co.
Horace J. Henty	Avon, Livingston Co.
George V. Fellows	Baldwinsville, Onondaga Co.
L. M. Tappan	Baldwinsville, Onondaga Co.
Barber & Robinson	Bolton Landing, Warren Co.
J. P. Badore	Bombay, Franklin Co.
Decker Mfg. Co	Brockport, Monroe Co.
Borden's Farm Products Co., 992 Gates av.	Brooklyn, Kings Co.
Thos. Rockford, 1066 Bedford av	Brooklyn, Kings Co.
J. A. Shephard & Son, Atlantic & Fountain avs	Brooklyn, Kings Co.
Brunn's Carriage Mfg. Co., 1140 Main st.	Buffalo, Erie Co.
J. Christensen, 635 Genesee st	Buffalo, Erie Co.
George Clarke, 249 15th st	Buffalo, Erie Co.
E. A. Cook Wagon Works	Buffalo, Erie Co.
John D. Davis Wagon Works, 172 Elk st.	Buffalo, Erie Co.
Fred L. Grampp, 206 Chicago st	Buffalo, Erie Co.
Handel Wagon Works, 314 Seneca st	Buffalo, Erie Co.
L. Noellers Sons, 43–47 Locust st	Buffalo, Erie Co.
John F. Vogt, 268 Jefferson st	Buffalo, Erie Co.
Wurster Wagon Works, 314 Seneca st	Buffalo, Erie Co.
Wm. Garrett	Canadaigua, Ontario Co.
Charles L. Wheeler	Canaseraga, Allegany Co.
F. M. Yocum	Canaseraga, Allegany Co.
Watson Products Corp	Canastota, Madison Co.
Alfred Slawson Est	Canisteo, Steuben Co.
H. J. Ackerman	Cato, Cayuga Co.
Edward Kennedy	Cato, Cayuga Co.
C. L. Sancomb	Chateaugay, Franklin Co.
Wm. Nelson	Claverack, Columbia Co.
I. E. Davis	Clayville, Oneida Co.
Charles Myers	Clifton Springs, Ontario Co.
Buckley & Kernan	Cortland, Cortland Co.

J. H. Waterman ..... Deansboro, Oneida Co.
Huber Carriage Works..... Delhi, Delaware Co.
E. J. Carpenter ..... Delphi Falls, Onondaga Co.

Neenan Bros. ..... East Bloomfield, Ontario Co.
E. D. Satterlee ..... East Otto, Cattaraugus Co.
F. W. Sykes ..... East Otto, Cattaraugus Co.
John Gibbon ..... Elton, Cattaraugus Co.

George Parsons ..... Forestport, Oneida Co.
Acme Road Machinery Co..... Frankfort, Herkimer Co.
E. A. Breese ..... Freeville, Tompkins Co.
George S. Monroe..... Freeville, Tompkins Co.

James Eaton ..... Georgetown, Madison Co.
H. M. Cronk ..... Grand Gorge, Delaware Co.
Jason Weeks ..... Greenwood, Steuben Co.

B. Braum ..... Hempstead, Nassau Co.
Davis B Todd..... Hempstead, Nassau Co.
Eaton & Fisher ..... Holcomb, Ontario Co.
D. F. Tanner ..... Holland, Erie Co.
R. R. Durkee..... Hume, Allegany Co.

James Rafferty ..... Kings Ferry, Cayuga Co.
John Mayer ..... Kingston, Ulster Co.

Adam Walburger ..... LaFayette, Onondaga Co.
Wm. Eitleman ..... Livingston, Columbia Co.
Philip Deuchler & Son..... Lyons, Wayne Co.

D. D. Costello..... Manlius, Onondaga Co.
Willis Kinyon ..... Marietta, R. D. No. 2, Onondaga Co.
Francis McGarry ..... Merrifield, Cayuga Co.
George S. Cady & Son..... Moravia, Cayuga Co.
George FitzSimmons ..... Morrisville, Madison Co.
D. B. Jones ..... Morrisville, Madison Co.
F. R. Brady..... Mt. Vernon, Westchester Co.

Roscoe Velie ..... Nassau, Rensselaer Co.
Everett Mfg. Co..... Newark, Wayne Co.
Arthur Colvill ..... Newburgh, Orange Co.
George Anthon, 507 W. 54th st..... New York, New York Co.
W. Babor, 417 E. 75th st..... New York, New York Co.
Wm. Koenig, 24 Lawrence st..... New York, New York Co.
J. Kramer & Sons Mfg. Co., 673–679 Water st. ..... New York, New York Co.
Liberty Wagon Works, 540 W. 40th st.... New York, New York Co.
New York Wagon Works, 1924 1st av.... New York, New York Co.
Peters & Heins, 503–505 E. 82d st..... New York, New York Co.
Henry Reinmuller & Sons, 521 W. 47th st.. New York, New York Co.
M. Sahr, 1892, First av..... New York, New York Co.
Yorkville Wagon & Auto Body Bldg Co., 336 E. 64th st..... New York, New York Co.
The Buffalo Sled Co..... North Tonawanda, Niagara Co.

James McCasland	Ogdensburg, St. Lawrence Co.
Conklin Wagon Co	Olean, Cattaraugus Co.
G. W. Wayne	Otto, Cattaraugus Co.
Champion Wagon Works	Owego, Tioga Co.
W. C. Woodford	Pompey, Onondaga Co.
Thos. McWhinnie	Poughkeepsie, Dutchess Co.
T. J. Parry	Remsen, Oneida Co.
J. W. Reed	Remsen, Oneida Co.
E. C. Locke	Richville, St. Lawrence Co.
Caley & Nash, Inc., 1828 E. av	Rochester, Monroe Co.
Deusing & Zieres	Rochester, Monroe Co.
George A. Lane	Rochester, Monroe Co.
Fitch Gear Co	Rome, Oneida Co.
N. Forget	Roslyn, Nassau Co.
R. Winkler & Son	Salisbury, Herkimer Co.
R. M. Whitney Co., Inc	Salisbury Center, Herkimer Co.
Adelbert Weller	Salt Springville, Otsego Co.
Jay B. Baker	Sanitaria Springs, Broome Co.
Warners Repair Shop	Schoharie, Schoharie Co.
John A. Lehman	Seward, Schoharie Co.
D. J. Van Vlack	Silver Creek, Chautauqua Co.
Lyons Mills	Solsville, Madison Co.
S. J. King	Somerset, Niagara Co.
Zorn & Schrengauer	Stapleton, Richmond Co.
H. A. Moyer, 241 Wolf st	Syracuse, Onondaga Co.
Valentine Gaetz	Troy, Rensselaer Co.
Wallings Carriage Works	Utica, Oneida Co.
Charles G. Richenecker	Watervliet, Albany Co.
I. J. Misner	Woodbourne, Sullivan Co.
Hadsell Bros. Co., Inc	Worcester, Otsego Co.

Veneer

Crandall Panel Co., Inc	Brocton, Chautauqua Co.
Standard Veneer Panel Co., 241 37th st	Brooklyn, Kings Co.
American Panel Co	Cattaraugus, Cattaraugus Co.
Jamestown Panel Co., Inc	Jamestown, Chautauqua Co.

Whips and Umbrella Sticks

Buffalo Whip Co., 335 Glenwood av	Buffalo, Erie Co.
Ulster Wood Products Co	Ellenville, Ulster Co.
Empire State Whip Co	Windsor, Broome Co.
Windsor Whip Co	Windsor, Broome Co.

Woodenware and Novelties

Spies Bros. & Gould, Inc. ..... Adams, Jefferson Co.
C. M. Mallory ..... Albion, Orleans Co.
John McCarthy ..... Albion, Orleans Co.

W. W. Babcock Co. ..... Bath, Steuben Co.
Big Indian Wood Products Co. ..... Big Indian, Ulster Co.
Glidden, W. L., 1035 Atlantic av. ..... Brooklyn, Kings Co.
Show Woodworking Co., 14 Dunham pl. .... Brooklyn, Kings Co.
Standard Wood Turning Co, 661 Margan av. ..... Brooklyn, Kings Co.

L. A. Miller ..... Cairo, Greene Co.
B. W. Vaughn ..... Cairo, Greene Co.
H. E. Horbrook Co. ..... Caledonia, Livingston Co.
Up-to-Date Advertising Co. ..... Canisteo, Steuben Co.
Setter Bros ..... Cattaraugus, Cattaraugus Co.
W. B. Buell ..... Cold Brook, Herkimer Co.
F. W. Barker ..... Coopers Plains, Steuben Co.

Ames Mfg. Concern ..... Falsoner, Chautauqua Co.
Fayetteville Mfg. Co. ..... Fayetteville, Onondaga Co.
Hollenbeck & Son ..... Fort Jackson, St. Lawrence Co.
Edgar Palmer ..... Freehold, Greene Co.

Bacon & Co. ..... Gasport, Niagara Co.
L. Holden ..... Gilbertsville, Otsego Co.
John J. Finkle ..... Gloversville, Fulton Co.
F. D. Peters & Co. ..... Gloversville, Fulton Co.

Catskill Mt. Souvenir Co. ..... Hensonville, Greene Co.
S. J. Bens Co. ..... Herkimer, Herkimer Co.
H. M. Quackenbush ..... Herkimer, Herkimer Co.
Ralph Cooper ..... Holland, Erie Co.
Edward Hope ..... Hurleyville, Sullivan Co.

Edward L. Gossett ..... Jamestown, Chautauqua Co.

Adler Veneer Seat Co. ..... Long Island City, Queens Co.
Klein Bros ..... Long Island City, Queens Co.
Charles J. Teape ..... Long Island City, Queens Co.

A. A. Clark & Sons. ..... Marion, Wayne Co.
George C. Topping ..... Marion, Wayne Co.

Kalt Lumber Co., 320 E. 64th st. ..... New York, New York Co.
Maron Woodworking Co., 519 W. 45th st. . New York, New York Co.
National Hanger and Fixture Mfg. Co., 496–498 E. 134th st. ..... New York, New York Co.
N. Y. Ladder Co., Inc., 384 Hudson st. .... New York, New York Co.
N. Y. Mallet and Handle Works, 743 E. 11th st. ..... New York, New York Co.
Schloss Bros., 637 W. 55th st. ..... New York, New York Co.
Cheseboro Whitman, 1167 First av. ..... New York, New York Co.
S. W. Johnson & Sons. ..... Nichols, Tioga Co.

E. W. Baker & Sons..... Orwell, Oswego Co.
W. H. Lattimer & Sons..... Orwell, Oswego Co.

Charles E. Post..... Palenville, Greene Co.

F. B. Pease Co..... Rochester, Monroe Co.
H. P. Sickles Co., 840 University av..... Rochester, Monroe Co.

George W. Kidder..... Staatsburg, Dutchess Co.
W. C. Cure..... Stamford, Delaware Co.
Schoeck Mfg. Co., Spencer st..... Syracuse, Onondaga Co.
E. C. Stearns & Co..... Syracuse, Onondaga Co.

Burgess Howard ..... Tannersville, Greene Co.
Oval Wood Dish Co..... Tupper Lake, Franklin Co.

Garner Print Works and Bleachery..... Wappingers Falls, Dutchess Co.
Spies Bros. & Gould, Inc..... Watertown, Jefferson Co.
John S. Tilly Ladder Co..... Watervliet, Albany Co.
American Novelty Co..... Wellsville, Allegany Co.
Frank Conklin ..... Willowemoc, Sullivan Co.
Henry Becker ..... Woodridge, Sullivan Co.

H. L. Clark..... Vernon, Oneida Co.

Miscellaneous Industries

Artificial Limbs

George R. Fuller Co..... Rochester, Monroe Co.

Bottle Stoppers

Independent Cork Co., Inc., 574 Hamilton av. ..... Brooklyn, Kings Co.

Bungs

Stephan Kampf, 186 Jefferson st..... Albany, Albany Co.

Butchers' Supplies

A. B. Schreckinger, 809 First av..... New York, New York Co.

Cores and Plugs

W. G. Case & Co..... Black River, Jefferson Co.

Adirondack Core & Plug Co..... Carthage, Jefferson Co.
Setter Bros. Co..... Cattaraugus, Cattaraugus Co.

Florists' Sticks

W. J. Cowee..... Berlin, Rensselaer Co.

W. F. Babcock..... Camden, Oneida Co.

A. W. Winters, Jr..... Unionville, Orange Co.

Mop Wringers

White Mop Wringer Co..... Fultonville, Montgomery Co.

Mouse Traps

Shann Manufacturing Co..... Middletown, Orange Co.

Playground Equipment

James F. Wilbur..... Berkshire, Tioga Co.

Allen Herschell Co..... North Tonawanda, Niagara Co.

Reels

M. E. Woodcock..... Edwards, St. Lawrence Co.

National Conduit & Cable Co..... Hastings-on-Hudson, Westchester Co.

Signs and Supplies

Up-to-Date Advertising Co..... Canisteo, Steuben Co.